









THE
DICTIONARY OF
ARCHITECTURE

ARCHITECTURAL PUBLICATIONS

NEW YORK

1891

Vol. I



THE
DICTIONARY OF
ARCHITECTURE

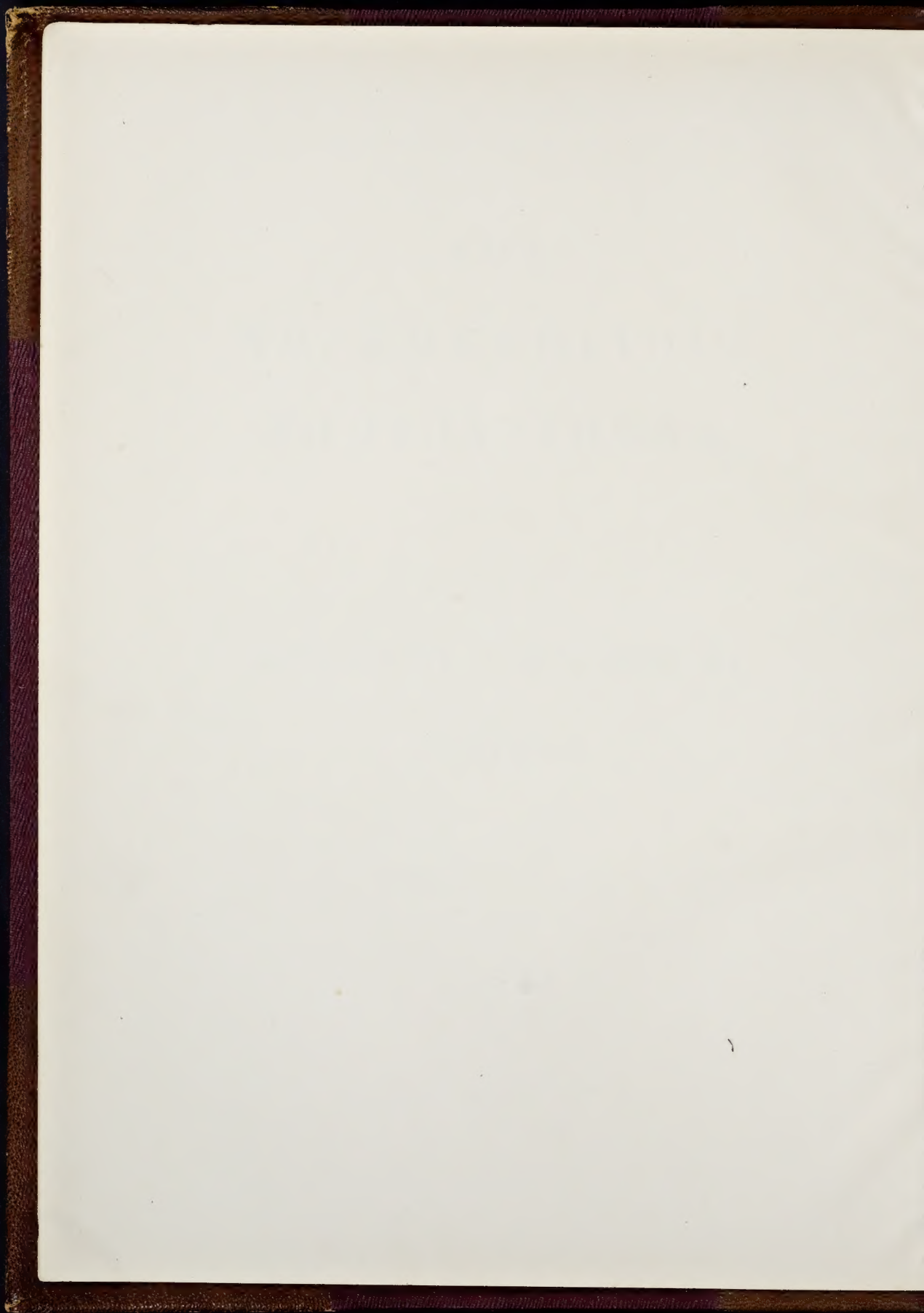
ISSUED BY

THE
ARCHITECTURAL PUBLICATION
SOCIETY.

WITH ILLUSTRATIONS.

VOLUME VI.

PRINTED BY THOMAS RICHARDS,
LONDON.



THE DICTIONARY OF ARCHITECTURE.

SACC

S (Fr. *esse*). The end of a tie-rod, beam, or holdfast, forming a large washer in the shape of the letter, and appearing on the face of the wall. ANCHOR. KEY. 4.

S, or SYPHON TRAP. A trap formed of pipes of lead, stone-ware, or other material, worked somewhat to the form of the letter S. It is preferable to the D TRAP which has lately been improved by its being formed of one diameter.

SABATINI (DON FRANCISCO), and Sabbatini, was born 1722, at Palermo. He studied architecture in Rome, and was employed at Naples by his father-in-law L. Vanvitelli, as second overseer of the works at the palace of Caserta. He afterwards erected the cavalry barracks near the ponte della Maddalena, and the arsenal armoury. In 1759 he went to Madrid, where he made additions and alterations at the royal palace (by G. B. Sachetti); and also at the palaces of Aranjuez, and of el Pardo (by Sachetti); directed the building of the large new cathedral at Lerida (designed *cir.* 1760-90 by P. Cermeno); designed 1769 the *aduaa*; enlarged 1784 the hospital el grande; completed 1788 the puerta de Alcalá; designed the puerta de S. Vincente; the royal porcelain factory at Buen Retiro; the mausoleum (carved by Gutierrez) of king Ferdinand VI (died 1788) and his queen, in the church de las Salesas Viejas; completed 1784 (after A. Pló) the church of S. Francesco el grande (begun 1761 by fra Francisco); designed 1781 the Palafox chapel in the cathedral at Osma; the great altar in that at Segovia; and the casa de los ministerios for Charles IV (1788-1808), of which the grand staircase and vestibule were much damaged by fire 31 Oct. 1846. He aligned the neuva Regalada and the Prado; and designed the arsenal at Caracas and other works in Spanish America. He was appointed arquitecto mayor del rey, and in 1792 inspector-general of engineers. He died 19 December 1797 or 98 at Madrid, and was buried in the parish church of S. Martin. He designed his own house in the calle nueva or nueva Regalada. 3. 14. 66.

SABICÛ; Eng. Savico, Savacu, and Sabicue. *Acacia formosa*. A hard, tough, and very durable wood of Cuba; of a dull red colour and close short grain. Its durability was proved by the six months' wear of the treads of the stairs in the Great Exhibition of 1851. HOLTZAPFFEL, *Woods, etc.*, 1843. 1. 71.

SABOOA; Essabona; Sabour; Arab. Wady Sabooah, in Nubia, having a temple of the epoch of Rameses II, leading up to which is a dromos of eight androsphinxes on each side. The rough stone surface of the chambers has been thickly plastered and the hieroglyphics impressed while fresh. GAU, *Nubie*, fol. Paris, 1822, p. 10, pl. 42-7. IRBY AND MANGLES, *Travels in Egypt, etc.*, 8vo., London, 1823, p. 95. 28.

SAC; see CUL DE SAC.

SACCARAH; see SAKKARAH, in Egypt.

ARCHITECTURAL PUBLICATION SOCIETY.

SACR

SACHETTI (GIAMBATTISTA), called don Juan Bautista Sachetti by Spanish writers, was born at Turin, where he studied under Z. Juvara, who recommended him to king Philip V of Spain to carry into execution Juvara's design for the royal palace at Madrid; but as this design was 1700 ft. square, and the king insisted on the palace being built on the site of the one burnt 1734, Sachetti designed 1736 another of 470 ft. square. This was commenced 7 April 1737, and is of granite of nine floors, 100 ft. to 150 ft. high. The sala de embajadores is given in VILLE-AMIL ET ESCOSURA, *España Artistica, etc.*, fol., 1842-59, iii. He also completed the façade of the palace of San Ildefonso (by Juvara); and designed the palace of el Pardo for king Charles V, for Barbara Plomberg resembling her German habitation; it was modified by F. Sabatini. He was director of the public school of architecture at Madrid; and honorary director of the academy of S. Ferdinand on its foundation 1752. He resigned his employments in 1760, and died 3rd December 1764. STIRLING MAXWELL, *Annals of the Artists of Spain*, 8vo., 1848, p. 1163. 3. 14. 25. 66.

SACCO (GENNARO), of Naples, where *cir.* 1613-80 he modernised the church and monastery of Monte Oliveto. 3. 36. 95.

SACELLUM (Lat. *sacra cella*). In ancient Roman architecture, a small enclosed space or chapel in which the lares and penates were placed. LARARIUM. ADESIOLA. ADES. When two columns were introduced IN ANTIS, it might be designated an AEDICULA, of which there was one in every street of ancient Rome, 423 in number. The sacellum was generally erected by the sides of public roads to afford facilities to travellers to pay their vows.

SACOME. A term borrowed from the Italian, and used in France for the exact profile of every member, of every molding, in the orders of architecture. 25.

SACRAMENT CHAPEL. A chapel enclosed by a screen and appropriated in a Roman Catholic church for protecting the sacred Elements formerly kept at the High altar.

SACRAMENTHÄUS; see SAKRAMENTHÄUS.

SACRARIUM. The cella, penetrale, or adytum, of a temple. A small apartment in a Roman house sacred to a deity. It has been used to designate the place in a chancel enclosed by rails in front of an altar. According to the ECCLESIOLOGIST *Journal*, 1849, ix, 157, this word in the present Roman Catholic ritual means exclusively the *piscina*. The same volume, p. 164-176, contains a communication which is nearly a treatise on the word. He notes that the classic meaning was a sacristy; that there are innumerable examples of its later use in the sense of *piscina* and of sacristy; that *capitulum, sancto sanctorum, and secretarium* (Council of Arles, 353, can. 15), as well as *presbyterium*, seem to have been used for the precinct of the altar; and on the

whole suggests that sanctuary should be substituted for sacra-
rium. PRESBYTERY. SANCTUARIUM. FACCIOLATI. MARTENE, *Ant.
Ecl. Rit.*, fol. Venice, 1783, iv, 45, 48, 60, 138-9. BINGHAM,
Orig., ii, 458. WEBB, *Cont. Eccles.*, 8vo., London, 1848, p. 485.
POOLE, *Eccles. Arch.*, 8vo., London, 1848, p. 227. *On the distinc-
tion of Chancel and Sacra-rium*, in the *ECCLESIOLOGIST Journal*,
1846, v, 133-9; which 1849, ix, 45, claims to have been "the first
who brought into common use the term *sacra-rium* for the
Christian Holy of Holies"; and 1846, vi, 200, explains that "the
sacra-rium is that portion of the church devoted to the celebra-
tion of the Holy Eucharist." 25.

SACRING BELL; see SANGTUS BELL.

SACRIST and SACRISTAN, or sexton. One of the obedientiarii
of the church. Under him were various officers, as explained in
SOMNER, *Antiq. of Canterbury*, fol., London, 1703, p. 95. The
sacrist received all the legacies and donations given for the
support and ornament of the buildings and utensils. To his
superintendence was submitted the construction and reparation
of the church and buildings, etc.; YATES, *History of Bury*, 193;
MON. ANGL., i, 298. He was sometimes secretary, auditor and
chancellor of the monastery. In some establishments part of
those duties were undertaken by a "magister operum". This
officer has been found mentioned in the following instances:—

- 1125-37 Paulinus at Rochester, built Frendsbury church. THORPE, *Custu-
mulo Roffense*, 162.
1222-37 Helias or Elias de Lideford, rebuilt a tower at Gloucester cathedral,
constructed the stalls, etc.
1319 William Stowe, built the steeple at Evesham abbey. RUDGE, *Evesham*,
28.
1321 Alan de WALSHINGHAM, at Ely cathedral. BENTHAM, *Ely*, 126-9;
146-9; 156; 269-71; App. 28.
1380 Richard Wortley, at Nostel priory, Yorkshire, painted the refectory,
made new stalls, metal work and images. *De Gestis*, HUNTER, *South
Yorkshire*, fol., London, 1831, ii, 208.
1416 Buildings and repairs made by the sacrist in virtue of his office,
£386 16s. RAINE, *S. Cuthbert*, 4to., p. 155.
1436 Samson, subsacrist and master of the works at S. Edmundsbury, col-
lected material for building the great tower.
1488 The mason to be paid by the sacristan. *Durham Indenture*.
1584 The duties and pay at Aberdeen are described in SPALDING CLUB,
Records of Aberdeen Burgh, 4to., Aberd., 1848, ii, 50-1; and Nov.
1595, p. 117, he had "ane gown of self blak as ane garment maist
convenient for his office".

SACRISTAN'S WINDOW. One still remains at All Saints'
church, Waltham, near Great Grimsby, Lincolnshire, looking
from the tower (Early English) into the nave; and another at
S. Giles, Scartho, in the tower assigned to the Saxon period.
The object of this opening is now difficult of explanation.

SACRISTY; REVESTRY and VESTRY in small English churches
(Gr. *Diaconion*, *Diaconicon*; Lat. *Sacra-rium*, *Secretarium*, *vestia-
rium*; It. *sagrestia*; Span. *sacristia*; Fr. *sacristie*; Ger. *Gerk-
ammer*). An apartment in large churches wherein are kept the
vestments and utensils used in the services and celebrations. In
ancient times it was called SECRETARIUM and DIACONICUM. Very
few ancient sacristies exist; *ECCLESIOLOGIST Journal*, 1845, iv,
197. The *ECCLES. Journal*, 1849, ix, 136, states that the
sacristy should be parallel to the chancel; and the fireplace in
the outside wall; see also 1850, xi, 216; which also, 1846, v,
5-10, and vi, 121-3, *On Sacristies*, gives a list of examples in
England of its position on the north side of the chancel, like the
rigidly prescribed *diaconicum* of the Greek church. The sacristy
was ordinarily placed between the chapter-house and the
church, and usually adjoined the south transept on ritual
grounds of convenience; but it is found on the north side of
the choir at Thornton and at Canterbury; on south side at S.
Mary's abbey, York; at Lichfield, Leiston, Hulne, Selby, and
Furness; and at the east end of the choir at S. Mary's, Warwick,
and at Malvern. At Castle Acre and at Thetford it is placed in
conjunction with an almonry on the north side of the *north*
transept; and to the south of the *south* transept at Westminster;
on west side of it at Peterborough, Ely, and Chichester; and
east at S. Alban's and Norwich. The "Ostrie chapel" in the

west aisle of the south wing of the transept at Peterborough is
said to be a corruption of sacristy; ASSOCIATED SOCIETIES, *Re-
ports and Papers*, 1878, p. 273; and the "castellan's rooms" at
the north-east angle of the nave at Christchurch, may also be
so; WALCOTT, *Church Arrangement*. At Felkirk, Yorkshire, it
has a stone roof, possibly similar to that of the porch, given in
ROBSON, *Mason's Guide*, 4to., London, 1862. At Wimborne
minster it is at the south-west corner of the south choir aisle,
15 ft. square with sexpartite vaulting.

The sacristy at Noyon was a two-storied circular building
opening on the east side of the transept; and that at Marl-
borough seems to have had two stories; *ECCLES. Journal*, 1846,
v, 121. At Rüngsdorf in Prussia, is a sacristy north of the
chancel, to which WEBB, *Cont. Eccles.*, 1848, p. 54, notices that
"the English position of the sacristy would not suit an apsidal
church".

BINGHAM, *Origines*, ii, 476. DUCANGE, v, 759; vi, 148. LE-
NOIR, *Arch. Mon.*, ii, 287; 367. VIOUET LE DUC, *Dict.*, s.v.
Cathédrale, 377, and 436. 25.

Burgos; Wells; Calzada (MORONI, *Diz.*, iii, 305); and S. Lo-
renzo at Florence, have two rooms; while Calatayud (MADOZ
261); and S. Peter's at Rome, have three halls.

The following sacristies are mentioned as deserving notice.
S. Peter's at Rome, designed 1775 by Carlo Marchionni for
pope Pius VI, and decorated with a richness scarcely inferior
to that of the church itself. Sta. Maria Maggiore at Bergamo,
octangular, erected 1430, is among the earliest examples of the
use of the Roman style in juxtaposition with Gothic. S. Satiro
at Milan, a gem by Bramante, octagon, sculptured by Cara-
dosso. San Marco at Venice, 1517-30, mosaic to curved roof
(*Illustrations*, s. v. Ceiling, pt. 2, pl. 41, 1850); the presses and
seats are richly ornamented with *intarsiatura*, the best by Fra
Seb. Schiavone; and Sta. Maria Gloriosa de' Frari (WEBB, *Cont.
Ecclesiology*, 8vo., 1848, p. 280). At Florence, Santa Croce,
richly decorated: San Lorenzo, the old one by Brunellesco;
the new one by Buonarroti, combining the union of architecture
and sculpture: Santa Maria Novella, Gothic and vaulted, by
Fra Jacopo di Nipuzzano: Santo Spirito, by Cronaca; the ves-
tibule 1500 by A. Contini is given by GRANDJEAN ET FAMIN,
Arch. Toscane, pl. 44; which, pl. 97, gives the sacristy at Siena
cathedral. The sacristie et trésor at Notre Dame, at Paris, of
xiv cent.; *Moniteur des Architectes*, 1852, p. 29; and by Soufflot,
14 plates in DUMONT, *Recueil* (1767). 28.

SACSAHUAMAN. The fortress of; see CUZCO in Peru; and
RIMACHI.

SADDLE. A term used in Suffolk for a thin piece of wood
fixed on the floor between the jambs of a door and under it, so
as to allow it to pass clear over the carpet.

SADDLEBACK or PACK-SADDLE ROOF (Fr. *dos d'âne*). A
tower having a top in the form of a common roof gable. Ex-
amples occur at Rothersthorpe church, Northamptonshire,
BRITISH ARCH. Journal, 1845, pt. i. Barton-on-the-Heath, near
Moreton-in-the-Marsh; and Little Compton, near Barton, War-
wickshire. Stroxtun new church, Lincolnshire. One near Lynn.
Brookthorpe church, Northamptonshire, *cir.* 1260. Minster, the
only example in Cornwall; *BUILDING NEWS Journal*, vi, 747.
S. Mary, Combyne, Devonshire; *CHURCH BUILDER Journal*,
1878, p. 166. There are several in Scotland: and many occur
on the continent. Rapperschwyl, and on the lake of Zurich;
STREET, *Brick and Marble Arch.*, 1855, p. 24-5.

SADDLEBACK COPING. A stone coping worked thicker
in the middle than at the edges. 1. 6.

SADDLE-BAR. The iron bar fixed horizontally in window
openings, to which leadwork is fixed in glazing. They were
formerly placed from 8 to 9 ins. apart, which allowed the
glazier to fix his lead across the light in front of the saddle-bar
and so to conceal it, an arrangement carried to great perfection
during the first half of xvi cent. 1.

SADDLE-ROOM. The place for the saddles is generally in
the HARNESS-ROOM, where a row of saddle-trees is fixed from

6 ft. to 8 ft. from the floor, with hooks, etc., for the bridles, etc., under them. Near the fireplace is a glass case in which the curbs, bits, spurs, chains, and other small steel articles are hung in order. In a large establishment, the saddle-room may be a separate apartment. KERR, *The Gentleman's House*, 8vo., London, 1871, 3rd edit., p. 266.

SADDLE-STONE. The upper or crowning piece of the coping of a gable, carrying the gable cross or other ornament.

SADE (POULON DE), eldest son of Hugues de Sade and the celebrated Laura de Noves, was architect to and dean of the metropolitan church at Avignon. He died before 1348 in the twentieth year of his age. DOBSON, *Life of Petrarch*, 8vo., Dublin, 1777, i, 293.

SÆVIUS LUPUS (CAIUS), occurs in an inscription, "Marti Aug. Sacr. C. Sævius Lupus Architectus A. F. Daniensis Lus + Anus EX. V. P.", given in GRUTER, *Inscr.*, 57, 7.

SAFE. A plate of lead turned up at the edges and laid on a floor, as under a bath, water-closet apparatus, washing-basin, and such like, to retain any overflow of water, and by a pipe to carry it away; this pipe should not enter a soil pipe.

SAFE. A closet, ranging from the "meat-safe" of a larder to the iron fire and thief-proof safe, and to such elaborate erections as "The National Safe Deposit Company's" premises, London, described by WHITCHORD, in ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 17 January 1876. The Liverpool Safe Deposit Company had a Milner's safe, 35 ft. long, 27 ft. wide, and 7 ft. 6 ins. high erected 1879. Chatwood's safe is described in *ENGINEERING Journal*, Nov. 13, 1868. *Chubb's Patent Safe*, in *ENGINEER Journal*, 10 May 1867. *Bank Cellars* at Paris, CIVIL ENGINEER, *etc.*, *Journal*, xxvii, 363. PRICE, *On Fire and Thief-Proof Depositories*, etc., 8vo., 1856. TOMLINSON, *On Locks*, etc., 1868. BUILDING NEWS *Journal*, *On Safes*, 1865, p. 146; 1869, p. 266; 296; 330; 360-2. A fire and thief-proof safe was first patented in 1834. CHUBB, *Protection*, etc., 8vo., London, 1875. **MUNIMENT ROOM. PLATE CLOSET. STRONG ROOM.**

SAFE or SAFETY LINTEL. The timber or iron lintel placed behind a stone lintel, or behind an arch of a door or window.

SAFE LOAD; see FLOOR (LOAD ON A); GIRDER. IRON. STRENGTH OF MATERIALS. MARBLE. 1.

SAG. The term in use when a girder, joist, etc., has deflected or sunk. BEAM. A door is said "to sag" when it sinks from its proper position and drags upon the ground.

SAGARCOLO (MARTIN), 1551; see BURBACOA (M. DE). 66.

SAGARVINAGA (JUAN DE), born December 1710, in Busturia in Biscay. In 1733 he went to Madrid and worked at the new palace and at that of Aranjuez. At Burgos he repaired the façade of the cathedral; designed the capilla de S. Tecla, with other churches and bridges in the archbishopric: about 1750 the tower, façade, and sacristy of the cathedral at Osma; the sacristy of the prebends at Salamanca; and restored the middle apse (*naranjo*) of the church there; (1730-76) the tower and one of the portals of the church at Ciudad Rodrigo, where he added the *seminario conciliar*; and also the dome to the church of the Premonstratensian monastery (designed 1590 by F. Martin), and its cloister; the barracks at Medina del Campo (designed by V. Rodriguez); continued the rebuilding begun by J. Hermosilla y Sandoval 1760 of the great college of S. Bartolomé at Salamanca; the clergy house of the archbishop; the retables in stucco for the chapel of S. Salvador at Oviedo; constructed the chief cloister for the Benedictine monastery at Sahagun; and built numerous bridges and drains in several dioceses. In 1776 he was elected a member of the royal academy of San Fernando, and died in December 1797 at Salamanca. In the courts of *carteria* he stood alone. 66.

SAGE GREEN. A tint formed of *white*, raw timber, prussian blue, and venetian red. A good tint is produced by the addition of blue black, and yellow ochre to terre verte. 9.

SAGINE, sagene, and sazsheen. A Russian measure of length equal to 7 ft. English and Russian. ARSCHINE. FADEN or fathom (ORGYA).

ARCH. PUB. SOC.

SAGRARIO. The Spanish term for a parish church attached to and opening into a cathedral; also for the chamber, *el relicario*, or sacristy.

SAGREDO (DIEGO), chaplain to queen Juana, travelled in Italy. He published *Medidas del Romano o Vitruvio—necesarias à los oficiales que quieren seguir las formaciones de las basas, columnas, capiteles, y otros edificios antiguos*, 4to., Toledo, 1526, 2nd edit., Madrid, 1542; Toledo, 1549 and 1564. It was the first work on classic architecture published in Spain, and assisted the development of the Plateresque style. It was translated into French, *Raison d'Architecture Antique, extraite de Vitruve*, 4to., Paris, 1539, 1542, 1550. STIRLING MAXWELL, *Annals*, 8vo., London, 1848, i, 139. 66.

SAGRERA (GUILLERMO), was 1416 maestro mayor of the church of S. Juan at Perpignan, the plan of which he perhaps designed (STREET, *Gothic Arch.*, 8vo., London, 1865, p. 337). His contract, 11 March 1426, relating to the construction of the new *lonja* or exchange at Palma, in Mallorca, Germano-Gothic in style, is given in LLAGUNA, and translated by STREET, p. 514-6. CHAPUY, *Le Moyen Age*, iv, or pl. 183. He was also employed 1450 at the castel nuovo at Naples. 66.

SAGUNTUM; now Murvieto, the key to Valencia, in Spain. It is situated on the river Palancia, and is now three miles from the sea. Founded 1384 B.C. by the Greeks of Zacynthos, destroyed B.C. 219 by Hannibal; it was rebuilt by the Romans and became a municipium. The walls and citadel with two towers are chiefly Moorish, strengthened by Suchet in the French wars, by stones taken from the amphitheatre; there are also a small temple and a circus. MONTFAUCON, *L'Antiq. Expliquée*, fol., Paris, 1719-24, ii, 244, gives a plan by E. Marti, dean of Alicante; the description is translated by CONYNGHAM, *Observations*, etc., in ROYAL IRISH ACADEMY, *Transactions*, 1770, iii, 33; ROYAL INST. OF BRIT. ARCHTS., *Sess. Papers*, 1881-2, p. 94. H. PALOS, *Description* used by A. CONCA, *Descr. Odeip. della Spagna*, 4to., Palma, 1793-7. TAYLOR, *Voy. en Espagne*, 4to., Paris, 1826; 1832. ECHEIUM. PRECINCTIO. There is also a solid parish church (Corinthian); and the small church of S. Salvador, said to be the oldest in Spain, and having a timber ceiling. The square of the Echo, in LABORDE, *L'Espagne*, etc., fol., Paris, 1806. 25. 28. 50.

SAÏDA; the ancient name of SIDON in Syria.

SAID BEN AYUB. An Arab architect employed by Abd-el-Rahman 961-968 at Cordova. An inscription on a fountain in the entrance court, called the patio de los Naranjos, states it was finished by him 957-8 (year 346). CONDÉ, *Arabs in Spain*, 8vo., London, 1854, i, 449. 66.

SAIL; see SEEZ, in France.

SAILLANCOURT QUARRY. A stone used in the bridge at Neuilly in France; weighing 2408 oz. per cubic foot Engl. and takes 105,640 oz. to crush a cube 1.968 ins. Engl. WARE, *Vaults*, Tract ii, 8vo., 1822, p. 25.

SAIL OVER, over sale, or SAILING COURSE. "Sale over" in MOXON, *Mech. Exercises*, 4to., London, 1700, p. 39. The same as PROJECTION, salient or saliant. The projection of a member before the face of the work under it. VAUSING. 16.

SAINT. JAMESON, *Legends of the Saints and Martyrs*, 3rd edit., 2 vols., 8vo., 1857; DECK, *Calendar of the Anglican Church*, 8vo., Oxford, 1851. MORANT, *Indications of Dates*, 8vo., London, 1870; besides those quoted s.v. EMBLEM. 1.

SAINT ALBAN'S; see ALBAN'S (SAINT), in England.

SAINT CHAPELLE. An oratory or other consecrated place in which the treasures, charters, and collections of relics, of a church, monastery, castle, or town, were kept. VIOLETT LE DUC, *Dict.*, states that the *trésor des chartes* over the sacristy was an external and almost detached appendage to the saint chapel, both at Paris (1241-4, *Illustrations*, s.v., Plan) and at Vincennes. Each great vassal, as the example he gives from S. Germain en Laye, equally had a sainte chapelle of the type above-named. Others were at Dijon, Bourges, Bourgogne, and Riom. ROYAL CHAPEL. *Chapel Palatine* (capella Palatina at Palermo) in GAILHABAUD, *Arch. du Vme siècle*.

SAINTE ANNE MARBLE. A marble of Belgium, grey and white and madraporic. It weighs 195 lbs. per cubic foot; BRARD, *Traité des Pierres Précieuses, etc.*, 8vo., Paris, 1808: and *Minéralogie*, 8vo., Paris, 1821, ii, 273.

SAINTEs and XAINTEs (Lat. Mediolanum Santonum, and Santones, chief town of the Santoni). A town in the department of Charente Inférieure, in France, situated on the river Charente, over which is a bridge erected before 1200 by ISENBERT, master of the schools there, who apparently retained the Roman triumphal double archway, of the time of Nero, at one end. The bridge was rebuilt 1665 by F. Blondel, of four arches, with a double drawbridge connecting the Roman archways with it, as shown in his *Cours d'Architecture*, fol., Paris, 1698, ii, 659-62; the archway is described ii, 598. It was taken down and re-erected close by when the bridge was rebuilt 1844. LABORIE, *Les Monuments de la France*, fol., Paris, 1816-36, i, pl. 24-5. There are considerable remains of an amphitheatre, having an arena 57 ft. by 70 ft., having the dens and water conduit; also slight portions of an aqueduct, and of a circus. Baths were discovered 1851-2, as in *BUILDER Journal*, 1852, x, 785.

The (former) cathedral, dedicated to S. Pierre, has a cloister of early pointed date, and a campanile of xv cent. The church of S. Eutrope was commenced 1081 on a new site, and dedicated 1096 (INKERSLEY, *Arch. of France*, 8vo., London, 1850, p. 6; 46), its Romanesque choir and transepts date in the xii cent; its underground church is one of the largest in France; a bell-tower of xv cent. was erected for king Louis XI. The church of S. Palais is Romanesque; that of S. Marie des Dames, xi and xii cents., is one of the historical monuments of France. The former episcopal residence is now the sous-préfecture. VINET, *L'Antiquité*, 4to., Bordeaux, 1871. MOREAU, *Saintes*; and *Rapport sur les découvertes—en 1837*, in *BULLETIN MONUMENTAL*, iv, 14. 25. 28. 50. 96.

SAINTEs or XAINTEs (I. DE); see ISENBERT.

SAINT FAR (EUSTACHE DE), also an engineer, was royal architect at Paris, and architect to the comte d'Artois. He published *Plans, etc., de S. Genesivère*, 4 pl.: view of the bridge at Mente (? Mantes by Hupéau); some plates after Pannini engraved by P. Anquier: and *cir.* 1786 designed the hospice des Vénériens, faubourg S. Jacques; given in KRAFFT, *Portes Cochères*, 4to., Paris, 1838, pl. 6.

SAINT GALL (Ger. S. Gallen). A town near Constance in Switzerland, situated on the stream Steinach. It is still surrounded by old walls, with towers dating from 954, but the ditches have been filled up. S. Gallus, a monk, who travelled in the early part of vii cent. with S. Columbanus and others from Iona, on being left through illness at the lake of Constance founded the Benedictine abbey. SOMMERARD, *Album, etc.*, ii, 484, states it was designed or rebuilt by Winihard, and continued by Isenricus and Gozpertus or Gotzbert. The church was rebuilt 1766, and created a cathedral in 1823. The vast monastery dates from xvii and xviii cents.; the abbot's palace now serves as a seminary. Plan drawn about 829-36 given in *Journal of ARCHEOLOGICAL INSTITUTE*, 1848, v, p. 86. KELLER, *Bauis des Klosters S. Gallen vom Jahr 820*, 4to., Zurich, 1844. LENOIR, *Arch. Mon.*, i, 35. POPP, *Kathedralkirche zu S. Gallen*, 8vo., 1855. *BUILDER Journal*, xviii, 812. *ECCLESIOLOGIST Journal*, v, 116. *DRAWING*, p. 66. DALY, *Revue Générale*, ix, 315; x, 25-30; xiv, 13. On a small scale in VIOLETT LE DUC, *Diet.*, s.v. Arch. Monastique, i, 243. A monastery is converted into public offices; and a fine cantonal school or public seminary contains the museum, etc., picture gallery, and town library. A protestant church was completed, Sept. 1862. Several histories of the canton and town are named in British Museum Catalogue. 28. 50. 92. 96.

SAINT PAMIErs and POMIErs; see PAMIErs, in France.

SAINT PATU (maestre GUILLAUME DE), master mason to king Louis IX, had 1260 granted to him the mastership of the masons in Paris for so long as it should please him. He was succeeded in office by master Renaut le Breton, and 1317 by P. de Pontoise as *juré* of the craft. DEPPING, intro. to BOILEAU, *Le*

Livre des Maîtres, 4to., 1835, p. 112. GOULD, *History of Freemasonry*, 4to., Edinb., 1882, i, 197-9.

SAINT PETERSBURGH; see PETERSBURGH.

SAINT PÖLTEN; see PÖLTEN, in Lower Austria.

SAINT URBAIN (FEIDINAND DE), designed la primatial, at Nancy. MOREY, *Herd de Corny*, 8vo., 1863, p. 9.

SAINT YVED DE BRAINE; see YVED (SAINT).

SAIS, the Egyptian Ssa, now Sa-el-Hagar. A site on the right bank of the Rosetta branch of the river Nile, in Egypt. Mariette's excavations revealed the complete ruin of this place of great importance during the one hundred and fifty years (B.C. 687-524) of the reigns of the Saite kings, until the Persian invasion of Cambyses. HERODOTUS, ii, 130, 179-5; xi, 163, 169, 171-5, refers to it, and mentions a monument of one block of granite (MONOLITH) which took 2000 men for three years to float down the river; SHARPE, *Hist. of Egypt*, 1876 (Bohn), 6th ed., i, 175-7, says it consisted of "a small number of large blocks, of which some are now in the British Museum"; also a colossus 75 ft. long. The place claimed the tomb of Osiris. The ruins of the walls of the town, about 70 ft. thick, still show crude brick with layers of reeds between the courses, and enclose an area of 2325 ft. by 1060 ft. The sites of the temple of Neith (Minerva), the tombs of the Saite kings, and possibly the palace of Anasis, are pointed out. RAMÉE, *Hist. de l'Arch.*, 12mo., Paris, 1843, i, 284-6.

SAKKARAH, Sakára, and Saccarah. A village situated near Abousoer, in lower Egypt. Near it is a necropolis, the oldest as well as the most modern of the cemeteries of MEMPHIS, and the largest. In the centre is the unique stepped PYRAMID among others, supposed to have been erected by king Onenephis of the first dynasty, and therefore may be the most ancient monument in the world; it was opened by H. C. M. von Minutoli in 1821. To the north are the tombs of the old empire, of Tili, of Ptah-hotep, and of Saboo; to the south are those of the xviii, xix, and xx dynasties. To the east the tombs of the old empire, then of xxvi and later dynasties, and the Greek cemetery; westerly is the Serapeum, a destroyed temple to Serapis; with the Apis mausoleum under, discovered 12 Nov. 1851, and 1860-61, by Mariette bey, consisting of an avenue 600 ft. long, which gave 141 sphinxes and the pedestals of many others; at the end of it was a semi-circle of statues of Greek writers and others, with other sculptures; beyond these were excavated galleries 400 yards long, containing the sacred bulls of the xviii to xxv dynasties, of xxvi dynasty to the later Ptolemies, *cir.* 650 B.C. to *cir.* 50 B.C.; having 24 granite sarcophagi, each about 13 ft. long, 7 ft. 6 ins. wide, and 11 ft. high, weighing about 60 tons (MEMPHIS); the lids had been moved, and the contents abstracted, having probably been plundered under Cambyses. The tomb of Psammetichus I (*cir.* 650 B.C.) is of hewn stone.

WALPOLE, *Memoirs*, 4to., London, 1817; 2nd edit., 1818-20. DESCRIPTION DE L'ÉGYPTE, fol., Paris, 1809-28, v, pl. VYSE, *Pyramids*, fol., London, 1839; and 8vo., 1840. ILLUSTRATED LONDON NEWS, 16 April, 1853, p. 284, gives the entrances, the great gallery, and a chamber and sarcophagus. MARIETTE, *Choix de Mons.*, etc., *découvertes*, etc., pendant le déblaiement du Sérap., 4to., Paris, 1856; *Le Sérap.*, etc., fol., Paris, 1857; and *Itinéraire de la Haute Égypte*. RHONÉ, *L'Égypte à petites journées*, 8vo., Paris, 1877.

SAKRAMENTSHAÜS. The German name for the English TABERNACLE; Fr. and Span. *custodia*: Lat. *ciborium*.

SAL; see SAUL.

SALAMANCA (anc. Salamantica; Sahuantica, a large and ancient city of the Vettones; Fr. *Salamanque*; old Spanish, *Roma la chueca*). A city in Spain, situated on the river Tormes, over which is a bridge 500 paces or feet long, and 12 wide, having 16 arches, those next the town being of Roman work, said to be of the time of Trajan (98-117), having *amohadillado* masonry, and the 10 or 11 others, *temp.* Charles V (1558-98); a portion of the wall is Roman, as are also several inscribed stones which still remain. It is the see of an archbishop. The old

cathedral, dedicated to the Assumption of the Virgin, erected *cir.* 1102 (Norman French), (perhaps by Cassandro and Florino de Pituenza, working at Avila del Rey); it has a well-adapted dome with four great circular pinnacles at the angles outside; a chapter house; two large cloisters 1170-8 (partly modernised) which up to 1433 were used for the schools of the university; and the capilla de Talavera, in 1510 destined for the Muzarabic ritual, belongs to the primitive construction; its roof 26 ft. diameter is of great interest; the plan by STREET shows the position of the two cathedrals.

For the new cathedral, under the same dedication, a design was prepared 1508-10 by A. Rodriguez and A. de Egas, on which a junta of maestro mayors and others was assembled 1512 (LLAGUNO, i, 293, who gives the names, etc., translated in STREET); a plan by Juan Gil de Hontañon was preferred; he was appointed *maestro principal* or *maestro de la obra*, with Juan Cuampero as clerk of the works. The cathedral was commenced 12 May 1513 in the Florid Gothic style with a leaning to Renaissance. In 1515 M. de Palencia with F. de Colonia reported on the works. In 1520 J. Gil was contractor for a considerable portion; and of works jointly designed 1520-4 (and partly executed) by A. de Covarrubias, J. de Alava, F. di Vigaray, and H. de Egas, which were being executed 1531 by J. Sanchez de Alvarado under J. Gil, who dying 1531 was succeeded by J. de Alava, who died 1537. Another junta was held 1522. Other works were executed 1534-38 by J. Negrete and other masons. The son Juan and also the brother Rodrigo assisted Juan Gil as *maestro* 1537-77; D. de Lasarte the *aparejador* to Rodrigo appears to have directed and conducted almost everything between 1538-72 during the many absences of his master. P. de Gamboa became 1572 *aparejador*, and 1577 *maestro mayor* till 1585; followed by M. Ruiz in 1585-8. In 1588 M. de Vergara, J. de Nantes or de Enantes, and others were consulted on some designs left by Rodrigo Gil (died 1577), when the design 1589 by Ribero Rada was preferred (he died 1600). The first service was held 1560; and the building was completed about 1734. The fine sculptures of the west front were by Juan de Juni and G. Becerra. The tabernacle *cir.* 1800 by M. M. Rodriguez; the tomb to king Felipe III, 1621 by C. de Honorato. The sacristy of the prebendados, *cir.* 1750 by J. da Sagarvinaga. The building is 378 ft. long and 181 ft. wide; the nave 130 ft. high (STREET, *Gothic Arch. in Spain*, 8vo., London, 1865).

Amongst the twenty-five parish churches in 1851 are mentioned: S. Marcos, Romanesque, *temp.* Ferdinand II, circular, with three apses inside (STREET). S. Matteo, Romanesque door (STREET). Sto. Tomé de los Caballeros, *cir.* 1136. San Cristobal, 1150. San Adrian, before 1156. S. Nicolas outside the walls, 1170. S. Martin, before 1173; it was burnt out 5 April 1854. Sto. Tomas Cantuariense 1179. S. Esteban or Santo Domingo, (enriched *Gothic Germanico*), before 1497-1524. S. Julian, restored XVI cent., has an old door. S. Juan de Barbalos y Sta. Eulalia, preserves old portions. The French destroyed, in 1812, 13 out of 25 or 30 monastic and conventual buildings. Nunnery of Sancti Spiritus was *cir.* 1780 renovated by Ramon Duran. Monastery of S. Agostino, capilla mayor 1516 by J. de Alava. Church of the monastery of Agostinos recoletos 1626, is attributed to G. Fontana of Italy (but he died 1614) for conde de Monterey. Church of the monastery of Agostinos descalzes, designed 1612-64 by L. de S. Nicolas and carried out by Pedro de S. Nicolas. Sumptuous monastery of S. Domingo; the portal 30 June 1524—18 Feb. 1610 is attributed to J. de Alava (died 1537) and carved by Ceroni of Milan, with A. Sardina (BUILDER *Journal*, xliii, 270); chapel modern Gothic. Dominican church and monastery of S. Esteban, 1524 by J. de Alava, with El Flaite as *aparejador*; 1554-60 by J. de Ribero Rada; continued after 1600 by P. Gutierrez; 1626 chapter house and sacristy by J. Moreno. Monastery and church del Carmen Calzada 1626-8 by F. de la Correa, one of the best in the city.

The university was founded about 1200; new statutes framed

1243, when it was attended by 14,000 students; dwindled to 400 in 1881. The greater schools were erected for about 10,000 in 1415 by A. Rodriguez Carpintero, maestro de la obra, and the lesser schools on the other side of the street begun by him 1433; the grand façade of the library is said to be alone worth a visit to the city. Of the few colleges left standing in 1813 by the French appear the following:—

Colegio de S. Geronimo, chapel 1589 by M. de Vergara.

Colegio de S. Bernardo, has the famous geometrical staircase 1609, by A. Maurique, bishop of Badajoz.

Magnificent colegio mayor de Santiago Apostolo el Zebedeo, or del arzobispo, founded 1522 by Alonso de Fonseca, archbishop of Toledo, design tending to Renaissance 1520 by Rodrigo Gil de Hontañon, carried out by P. de Ibarra, Gothic chapel and large Renaissance cloister with double gallery; *cir.* 1555 the *portada* or frontispiece by A. de Covarrubias de Leiva; 1625 J. Gomez de Mora; 1628 Juan Morena undertook to prosecute the works of Gil and Gomez; the chapel has fine sculptures by Michel Angelo and Berruguete, who 1529 undertook "to build, carve, and paint" the retablo of the chapel (agreement in Ponz, *Viaje de España*, 16mo., 1785, xii, 234); it was completed 1581. In 1592 the college was dedicated to S. Patrick for 12 students, and is now the colegio de Nobles Irlandeses, and partly a military hospital.

The colegio de S. Tomas, before 1497; elaborate façade and portico 1610: sala capltular 1637 by J. Moreno; fine cloister well restored.

Old college or colegio mayor de S. Bartholomé, erected 1410-15; rebuilt 1760-76 by J. Hermosilla y Sandoval, with staircase and two-storied cloister, and a large classic portico; continued by J. de Sagarvinaga; it is now the palace of the civil governor.

The vast and magnificent college of the Jesuits 1614-7, church and college by J. Gomez de Mora, continued by J. de Matos; the Jesuits were expelled 1768; RUIZ DE VERGARA, *Historia*, 3 vols., fol., Madrid, 1766-70.

Colegio de Alcantara, renovated *cir.* 1780 by Ramon Duran.

Colegio del rey, founded by Philip II, designed 1566 by Rodrigo Gil de Hontañon; 1613 design in continuation, and covering the great staircase, by J. de Nantes and A. de la Madre de Dios; continued from 13 June 1625 by J. Gomez de Mora (died *cir.* 1645); fine Doric quadrangle: restored after 1813, and now infantry barracks.

The plaza mayor having a colonnade on each side was laid out 1720 by A. Garcia de Quiñones, J. de Lara, and N. de Churriguera, and his son Geronimo Garcia, who completed it in 1733. It has afforded accommodation for 16,000 to 20,000 spectators when fitted up for a bull-fight. Among the houses deserving notice are, la casa de la Sal or Salines, casa de las Conchas, casa in plaza San Agustin, and in plaza Santa Tomé, the keep or torre del Clavero, the palaces of the marquis de Valdecarzana, of Almarza, of conde de Garcigrande, Maldonado, Espinosas, and of Monterey, which last was gutted by the French, given in VILLE AMIL ET ESCOSURA, *España Artistica*, fol., Paris, 1842-59, ii. The castillo de alba de Tormes, near the city, is given by ESCOSURA, vol. i.

GIL GONZALEZ DE AVILA, *Hist. de Sal.*, 4to., 1606. *Recuerdos y Bellezas de España*, 1865. MODESTO FALCON, *Sal. Artist. y Mont.*; and his *Guía de Sal.*, 1868. SPANISH GOVERNMENT, *Monumentos Arquitectonicos*, lar. fol., gives five plates of the old cathedral and section; two of the *portada* of the university; court of the colegio del arzobispo; and tomb of da. Elma y del chantre Aparicio. MEDINA, *Las Grandezas y Cosas notables de España*, fol., Seville, 1544; 1549; Alcala, 1566; 1595. The beautiful creamy stone of which the cathedral and colleges are built is obtained from the quarries of Villa Franca, three miles distant. 1. 14. 28. 50. 66. 96.

SALAMANCA (FRANCISCO), maestro mayor of the royal works at Valladolid, rebuilt 1567 the casas del consistorio, and the plaza mayor as it at present exists, though perhaps assisted by Juan Bautista of Toledo. Dying in 1573, king Felipe II continued his son, disciple, and successor, at Valladolid, and 1574 at Simancas. 66.

SALAMINIA. The district of the ancient Salamis of Teucer, in Cyprus. The collection of Phœnician, Egyptian, Greek, and Roman antiquities derived from ancient sites excavated by A. P. di Cesnola between 1876 to 1879, were published by him in 1882. This collection is distinct from that obtained by general

L. P. di Cesnola, and now at New York. The antiquities collected by G. Gordon Hake are Feb. 1883 in the South Kensington Museum. L'ANSON, at Royal Inst. of Brit. Architects, *Transactions*, 1882-3, p. 13. 96.

SALAZAR (LORENZO F. DE); see FERNANDEZ DE SALAZAR (L.).

SALCAH, now Sulchad, in the Hauran, in Syria, dating from about B.C. 306, where are still five hundred houses standing perfect. Cyril GRAHAM (ROYAL GEOG. SOCIETY, *Trans.*, 1858, xxxviii, 234, etc.), visited eleven of the cities beyond. PORTER, *Giant Cities of Bashan*, 8vo., London, 1867. MURRAY'S *Hand-book to Palestine*. PORTER, *Five years in Damascus*, 1855, ii, 176-88; BURCKHARDT, *Travels in Syria*, 1822, p. 100.

SALEM, cloister brother of GEORGE, built 1407-9 the *thaurm-chen* in the monastery at Bebenhausen. 92.

SALERNO (Lat. *Salernum*). A seaport and the capital of the province of Principato Citeriore, in southern Italy. The Greeks, Romans, Goths, and Lombards succeeded each other, the latter being expelled by the Normans under Robert Guiscard. It is enclosed by walls razed 1193 and rebuilt *cir.* 1250, the hill being crowned by the remains of a Norman citadel. The harbour, begun 1260 by Manfred, was completed 1318 by king Robert, and is now almost silted up; a new one (1882) is in course of formation. It is the see of an archbishop. The cathedral, erected 1084 by Guiscard, is dedicated to the Assumption of the Virgin and All Angels and to the Apostle S. Matteo, whose ashes, brought 930, are said to be in his tomb in the richly decorated crypt, which dates from VIII cent. or CIXCXXVI. Plan of the chapel and altar attributed *cir.* 1600 to Don. Fontana, is given by E. Corbin in *LECLERC, Revue*, fol., Paris, 1826, pl. 50. In the atrium are 28 granite Corinthian columns and 14 antique sarcophagi turned to Christian uses. Two ambones 1170 covered with mosaics and sculpture, one carried on twelve granite Corinthian columns, the other on four of the very rare black breccia called *Perfido nero bianco*; another ambo in the choir is said to have been given by John of Procida (1270-1302): a pavement of opus Alexandrinum in front of the altar, and two verde antico marble columns are also among the spoils brought from Paestum by Guiscard. The bronze doors at the west entrance were presented 1099, as described s.v. *DOOR*, (metal). The two lower stages of the detached campanile date 1130 for king Roger, the two upper tiers are modern.

In the city are seventeen churches; the monastery of S. Domenico having a good cloister; archbishop's palace; governor's palace on the modern corso di Garibaldi dates before 1840; statue to Pisacane 1857; new theatre; and the largo dei tribunale having the law courts, college, and public library. S. NON, *Voyage Pitt. de Naples, etc.*, fol., Paris, 1781-6, iii, 166. EUSTACE, *Classical Tour*, 8vo., London, 1813; 8th edit., 1841, 3 vols. *Illustrations*, s.v. opus Alexandrinum, 1854-55, pt. i, cold. plate 4, glass mosaic from the pulpit, XIII cent. 14. 28. 50. 96.

SALETTE (ANTONIO), of Verona, designed the portone dell' atrio of the church of SS. Nazzario e Celso; and various palaces. He died young. 39.

SALEZAN (DON MIGUEL DE), with P. I. de Lizardi, designed 1743 the parish church of Sta. Maria de la ciudad at San Sebastian, in Guipuzcoa; completed 1764 by F. Ibero; and several military and hydraulic works at Ferrol. 66.

SALIENT or SALIANT. The term used in respect of a projection of any part or member over a lower one. SAIL OVER. 1.

SALIENTES (Lat. *Aque Orientis*); see ORENSE, in Spain.

SALIGNO MARBLE (Fr. *Saligny*). A kind of white Carrara marble, so called by the ancients because it is of a coarse hard grain, like salt. 5.

SALISBURY or NEW SARUM. A city in Wiltshire, situated where the rivers Avon, Willy or Willey, and Bourne unite. Bishop Richard le Poore (1217-1228, and Durham 1237) fixed on the site for his cathedral, around which grew the town laid out in chequers, the streets running to the cardinal points: "Mitre corner" was the first house erected. The city is the see

of a bishop. The first stone of the cathedral, dedicated to the Virgin, was laid April 28, 1220, and it was consecrated 1258. Elias or Helyas de Derham or Berham, one of the canons, was "rector" for the first 25 years, and Robertus "cementarius rex" for 25 years, the church being carried out on the plan of a Lorraine cross and of one design, at a cost of 40,000 marks or £26,666 13s. 4d. The cloisters, each side 181 ft. long, and chapter house date 1263-70 and 1270-84. The two uppermost storeys of the central tower and adjacent works with the spire date 1330-75, at which time "Robertus the builder" was living, and 1334 Richard de Farleigh, mason, was appointed to the works and to succeed him on his decease. This fine spire (180 ft. high) was 1684 measured 404 ft. high from the ground by col. Wyndham (AUBREY, *Nat. Hist. of Wills*, 98), and 393 ft. 10 ins. by W. Fisher, clerk of the works, *cir.* 1814. In 1668 it was ascertained by Sir C. Wren to be 23 ins. out of the perpendicular, it was the same on Sept. 30, 1858; *BUILDER Journal*, xvi, 684. In 1394 Nicholas Portland was mason, and 1415 Robert Wavte. The library over the east walk of the cloister 1559-76. T. Naish was clerk of the works to the fabric in 1680 and in 1691; and another T. Naish in 1736-9; Francis Price was there 1737 to 1753 or later. A porch was removed *cir.* 1760 to the grounds of col. Wyndham (STOREY, *Antiq. Cabinet*, vii). James Wyatt 1782-91 destroyed much during a "restoration", including the detached campanile on the north side, of the same age as the cathedral. The stalls and throne (1766-82) were remodelled and canopies added by J. Wyatt. The tomb to bishop Bridport, died 1256, is given in GAILHABAUD, *Mons.*, iii. Some old and fine glass remain; (GRISAILLE; and two coloured *Illustrations*, 1861). The chapter house, 58 ft. diam. and 52 ft. high, was described by T. H. Wyatt at Royal Inst. of British Architects; CIVIL ENGINEER, *etc.*, *Journal*, 1843, vi, 161. It was restored and painted under H. Clutton and W. Burges, and reopened July 1856. BURGES, *Iconography, etc., of chapter house*, in *ECCLIOLOGIST Journal*, 1859. GAILHABAUD, *Mons.*, iii; DAVIS, in *BUILDER Journal*, 1858, xvi, 548-9. A general restoration of the cathedral was commenced after 1864 under G. G. Scott, R.A.; by April 1866 the exterior was done except west front, which was finished 1869; the choir, with great part of north and south transepts were reopened 1876; the cost being £52,000: the nave, north porch, and pavement followed.

Nave and aisles 82 ft. wide by 84 ft. high; choir and transepts 81 ft. high; length inside 449 ft.; outside 473 ft.: width of west front 111 ft. 4 ins. Alicia de Brucere gave the stone for 20 years from 1220 from the Chilmark quarries, twelve miles from the city and still worked. The Teffont quarries supplied greater part of the stone (BRITTON, *Beauties of Wills*, iii, 331). The wall of the close was erected 1331 of the stones from the church at Old Sarum. Of the episcopal palace, the hall, parlour, and chamber were erected by bishop Beauchamp (1450-81); it was remodelled by bishop Shute Barrington (1782-01) and a new entrance made.

The church founded 1240 of S. Thomas of Canterbury, (Perpendicular), restored 1868 by G. E. Street, R.A.; of S. Edmund, founded 1268; the central tower fell 1653 destroying transepts and nave: the chancel used as the church until a new chancel added by G. G. Scott, R.A.; and of S. Martin, are noticeable. Fisherton old church, rebuilt before 1869; East Hamham church 1854 by T. H. Wyatt; West Hamham church, XIII cent.; memorial church to George Herbert, poet, at Bemerton 1860 by T. H. Wyatt (*BUILDER Journal*, xviii, 804). S. Edmund Roman Catholic church by E. W. Pugin.

Council house 1788-94 by sir R. Taylor, but alterations were made in the design by W. Pilkington; council chamber is 75 ft. by 24 ft. New market house, opened May 24, 1859; *BUILDING News Journal*, v, 547. S. Nicholas hospital 1227, restored by W. Butterfield. S. Edmund's schools 1860 by H. Woodyear, B. J., xviii, 612; and *BUILDING News Journal*, vi, 754: the roof of boys' school-room belonged to an edifice of XIV cent. Bridge at Hamham over the river Nadder 1244. Old part of

the mill near, *temp.* Henrys VII and VIII. Also deserving notice are the old house near Poultry cross; hall of John Halle, *cir.* 1470; George inn; city workhouse, early xv cent.; King's arms; joiners' hall; tailors' hall; museum; and Blackmore museum, 1864. SARUM. STONEHENGE. AVEBURY.

LELAND, *Collectanea*, i, 117. PRICE, *Observations*, 1735. SCOTT'S *Report* on the cathedral in CHURCH BUILDER, 1870, p. 53-8. *Handbook of Wiltshire*, 1869. WINKLES, *English Cath.*, 1836-42. HALL, *Pict. Mem., etchings, with history of Old and New Sarum*, fol., Sal., 1834. DODSWORTH, *Salisbury Cath.*, 4to., 1792; and 1814. BRITISH ARCHEOLOGICAL ASSOCIATION, 8vo., 1851 and 1858. ARCHEOLOGICAL INSTITUTE 1849, 8vo., 1851. MILNER, *Diss. on the modern style of altering ancient cath. as exemplified at Sals.*, 4to., London, 1798. BRITTON, *Cath. Church*, 4to., London, 1814. HARRIS, *Epitaphs, etc.*, 8vo., 1825. STORER, *Cathedrals*, 8vo., 1814-19. JACKSON, *The Hungerford chapels*, 4to., Devizes, 1855. (RAWLINSON), *Hist. and Antiq. of Sals. Cath.*, 8vo., 1719. WALCOTT, *Memorials of Sals.*, 1865. LEDWICH, *Antiquitates Saris-buriensis*, 8vo., 1771; 1777. GODWIN, at the Bristol Society of Architects, in BUILDING NEWS JOURNAL, 1865, xii, 616. CASSAN, *Lives of Bishops, etc.*, 8vo., 1824, gives a long list of publications. WILLIAM DE WENDA or WANDA, dean 1220-37, *Account of the Removal of the See, etc.*, in the MS. Register of S. Osmund, in Sal. Cath.; part printed in Latin in WILKINS, *Concilia*, i, 551; extracts in DODSWORTH, 1814, p. 107, etc.; and PRICE, 1774, p. 3, etc.: to be printed by canon R. JONES in *Vetus Reg. Sar.*, etc., in Rolls Series, vol. ii. 1. 14. 28. 50. 96.

SALISBURY (ROBERTUS OF), "cœmentarius rexit per 25 annos" (? 1220-45 or 1245-70) at the cathedral; LELAND, *Itinerary*, 8vo., Oxford, 1744, iii, 81. Another ROBERT "the builder" was engaged there, in and before 1334, when R. de Farleigh is recorded as engaged to advise on the works and to succeed him.

SALIX; the willow, including the willows and osiers. They are chiefly natives of the colder parts of the temperate regions of the northern hemisphere; and are often associated with the yew and cypress in churchyards. The wood is perhaps the softest and lightest of English woods; and is easily turned into boxes, and planed for toys and bats. The colour is white, inclining to yellowish grey. The *Salix alba* and *Russelliana* are sawn into boards for floors; some species attain a height of 30 ft. to 40 ft. in twenty years; the red wood willow, *S. fragilis*, is said to produce timber superior to any other species; and is used for light and swift sailing vessels. The wood of the *S. caprea* is the heaviest of any of the species. In the Old Testament, the "willow" is now to be understood to mean the cleander; THISTRAM, *Nat. History of the Bible*, 8vo., London, 1867, p. 415-8.

Docks made of the willow are of frequent occurrence on the banks of the Rhine in Germany. One in 1854 was being built at La Crosse in Michigan, entirely of twigs about 12 ft. long, bound in bundles a foot thick, so ingeniously interwoven that sand will not work out or water work in. Each bundle contained about one hundred small trees, which sprout and firmly root together, forming a superstructure lasting for ages; BUILDER JOURNAL, 1854, xii, 444. FORBES, *Salicetum Woburnense*, 8vo., London, 1829. MICHAUX, *North American Sylva*, new edit., 8vo., Phil., 1850, ii. J. E. SMITH, *English Flora*, etc. HOOKER, *British Flora*, 1855. KOCH, *De Salicibus Europæis commentatis*. LOUDON, *Arbor. et Frut. Brit.*, 8vo., 1838. HOLTZAPFFEL, *Woods*, 8vo., 1843. 14.

SALLKENER (ERHARD), of Abensperrek, made 1491 the pulpit in the church at Kidrich; and 1510 the benches; he also made similar ones for Ganoderheim. LASSAULX in WHEWELL, *German Churches*, 8vo., edit. 1842, p. 157.

SALLOW; see SALIX.

SALLY; see SALIENT.

SALLY. A notch formed at the end of a piece of timber, being cut with an interior angle formed by two planes across the fibres. It differs from a BIRDSMOUTH in having the inside part of the notch horizontal instead of sloping upwards. It is a

ARCH. PUB. SOC.

form used at the lower ends of all inclined timbers resting on beams, and in rough work in the country. 4.

SALLYNGE (WALTER and RICHARD DE), two chief masons of the city of London, who 1356 signed with others a petition on behalf of the masons' hewers. GOULD, *Freemasonry*, 4to., 1883, p. 342.

SALLY PORT. A postern or side gate, or a passage underground, from the inner to the outer works of a fortification, intended as a passage for the garrison to sally from, or pass through. 19.

SALMANTICA. The former name of SALAMANCA, in Spain.

SALMON (WILLIAM), carpenter of Colchester, published *The London and Country Builders' Vade Mecum*, 8vo., 1745; and *Palladio Londinensis, or the London Art of Building*, 37 pl., 4to., 1734; 52 pl. 1743; 5th edit. 1755 by E. Hoppus, to which is annexed *The Builder's Dictionary*. WILLIAM SALMON junior, published *The Builders' Guide and Gentlemen's and Traders' Assistant, or a Universal Magazine of Tables*, at end of HOPPUS, *Gentleman's Repository*, 8vo., 1748; and *The Country Builder's Estimator, or the Architect's Companion*, 3rd edit. by E. Hoppus, 12mo., 1746; 8th edit. by J. Green, 1770. In 1820 a "William Salmon" was "late surveyor to the corporation of the Law Association".

SALMONBY STONE. A quarry near Horncastle, in Lincolnshire, famed for a stone of rich and varied tone of colouring, but often of treacherous quality; the church of S. Margaret is erected of it. ASSOCIATED SOCIETIES, *Reports and Papers*, 1876, p. 175.

SALOMON DE GAND; see GAND (S. and T. DE).

SALOMONIC; see SOLOMONIC ORDER.

SALONA. A ruined city in Dalmatia, still bearing its ancient name. It is situated at the mouth of the river Iader or il Giadro. It became the capital of Dalmatia 117 B.C.; was embellished by many emperors, especially by Diocletian A.D. 313, who erected his palace at SPALATO after the burning of the town 639 by the Avars. All the great Roman roads in Dalmatia met at this point. Portions of the old walls with the Cæsarian gate have been found; an arch of a bridge, the theatre, the elliptic amphitheatre 126 (?) ft. long with six arches of its outer circle entire; baths, temple to Concord, and sculptures exist; a Christian basilica and baptistery have been excavated. Parts of an aqueduct are shown in CASSAS, *Istrie*, fol., Paris, 1802, p. 13, 144; pl. 57. AMPHORÆ, excavated in 1825. FORTIS, *Viaggio in Dalmazia*, 4to., Venice, 1774. HUGHES, *Travels*, 8vo., London, 1830, i, 373. R. (R. H.), *Rambles in Istria*, 1875, p. 104. PATON, *Highlands, etc., of the Adriatic*, 8vo., 1849. GIBBON, *Decline*, edit. 1853, ch. xiii, 464. WILKINSON, *Dalmatia, etc.*, 1843, i, 151-64. LANZA, *Antiche Lapidæ Sal.*, Zara, 1850. CARRARA, *Top. e Scavi di Sal.*, Trieste, 1850, whose excavations, etc., 1842-8 are noticed, BUILDER JOURNAL, 1846, iv, 328; and v, 362; and BRITISH ARCHEOLOGICAL ASSOCIATION, *Journal*, 8vo., London, 1848, iii, 214-26. FREEMAN, *Subject, etc., Lands of Venice*, 8vo., London, 1881, p. 156-74. 23. 28. 50.

SALONIKA, in Turkey in Europe; see THESSALONICA.

SALOON (It. *sala*; *salone*; Fr. *salon*; *salle*; Ger. *saal*). An apartment of communication through which the chief rooms are approached. GALLERY. HALL. In Italy, a saloon is a state room, in France a grand room for reception, and in England not unfrequently a drawing room. In mansions of XVII and XVIII centuries it is a standard feature, occupying the middle of the garden front, out of which opens the principal apartments; KERR, *Gentleman's House*, 8vo., London, 1871, 3rd edit., 124; 170-5. Castle Howard, Blenheim, and other works by Sir J. Vanbrugh; Sion house, as published by Adam. Salle d'Apollon, and the chambre à coucher of Louis XIV at Versailles. The saloon at Willey park, Shropshire, 40 by 30 ft., by Louis Wyatt, is given in NEALE, *Seats*, 4to., London, 1825, ser. 2, ii. That at Wemyss castle, Fifeshire, by Peddie and Kinnear, in BUILDING NEWS JOURNAL, 1876, xxx, 648.

The Fr. term *salon* is used for an art gallery. FABRE ET DE VESLAY, *L'Arch. au Salon; Art Antique, Moyen Age, et Renais-*

sance, 33 pl., fol., 1872. THIOLLET ET ROUX, *Menuiserie, Modèles*, fol., Paris, 1825, pl. 49-54. 6. 14. 25.

The following afford the sizes of the saloon (Fr. *foyer*) where generally refreshments can be obtained in a theatre; the "crush room" is more of a passage only.

*Opera at Milan	100 x 24 feet
*Paris	34 "
Paris, New Opera, Emperor's saloon	45 ft. diameter
*Old Covent Garden	56 x 19 feet
New Covent Garden, crush room	51 x 25 "
Toole, King William Street, foyer	31 x 16 "
Princess, Oxford Street, saloon	29.6 x 26 "
" " smoking saloon	22.6 x 20 "
Her Majesty, Haymarket	57 x 19.6 "
Drury Lane, between columns	62 x 26 "
" " total length	85 "
New Prince, balcony, foyer, and stalls	18 x 25 "
*New Orleans	139 x 26 "
*Naples	82 x 20 "
*S. Petersburg	125 x 30 "

*MORNING CHRONICLE *Newspaper*, July 11, 1837; LOUDON, *Arch. Mag.*, 8vo., 1837, iv, 545.

SALSETTE; the island of; situated close to Bombay in Hindostan. There are a large number of rock-cut caves, now generally known as the (Canara or) Kenheri caves, which were greatly damaged by the Portuguese, who were dispossessed about 1750 by the Maharrattas. The plan of the Durbar cave, a two-storied vihara, is in FERGUSSON, *Indian Arch.*, 1876, p. 147; on p. 161 he describes the great Chaitya cave, a bad copy of the Karli cave; it belongs to the beginning of the v cent., none of the viharas are earlier, though some sanctity began early in iv cent. Another in his *Rock-cut Temples*, fol., 1845, pl. 19. The others are generally mere cells. FERGUSSON AND BURGESS, *Cave Temples of India*, fol., London, 1880.

LINSCHOTEN, *Voyage to the East Indies*, 1598. GEMELLI CARERI, *Voyage Round the World*, 1693. *Canorine* (or Canaree), *isle of Salsette*, description by David Guerin of Chelsea, and John Myngs; Brit. Mus., Add. MS. 15,505. A description of the *pagoda*, read 1727 to Soc. of Antiq., by S. Lethieullier; *idem* 6183, p. 14. HUNTER, *Account of Caverns*, in *ARCHÆOLOGIA*, 1784, vii, 286-302. DANIELL, *Antiq. of India*, fol., 1799, 4 plates; and reduced set. NIEBUHR, *Voy. en Arabie, etc.*, 1776-80; pl. reproduced in LANGLEL, *Mons. de l'Hindostan*, 4to., 1813-20, ii, pl. 77 et seq. LORD VALENTIA, *Travels*, 4to., 1809. FORBES, *Oriental Memoirs*, 4to., 1813, i, 422. HEBER, *Narrative*, 1824-5. HUMBOLDT, 4to., 1836, i, 150-168. 1. 14. 50.

SALT. Sodic chloride, sea-salt or common salt, also called muriate of soda. It has a specific gravity of 2.1 to 2.257. This material is recommended for the preservation of timber, and even in staying decayed timber. "Salt barrels" are always sound and will stand more wet weather than any other barrel or stave of its kind: BUILDER *Journal*, 1862, xx, 796. The LITERARY GAZETTE, 1820, p. 478, mentions that a ship built of spruce and white oak had after sixteen years all the timbers and planks in a perfect state; while on the stocks the spaces between the timbers were filled in with salt, and whenever opened for inspection salt was again put in.

Salt in the mortar used in building chimneys is said to cause the soot to fall every damp day: BUILDER *Journal*, 1855, xiii, 317. 14.

A Table exhibiting the names of the various localities from whence salt is obtained is given in RIPLEY and DANA, *American Cyclopædia*, 8vo., New York, 1875. The *Seesalzgewinnung*, etc., in Istria is given in ALLGEMEINE BAUZEITUNG, 1842, pl. 473-4. At Paris, the grenier de sel, rue de S. Germain, was designed 1698 by J. de la JOUE; BRICE, *Descr.*, 12mo., Paris, 1725, i, 210.

SALTING IN BRICK WALLS; see EFFLORESCENCE; also ATMOSPHERIC INFLUENCE; ceramics; damp; and DELIQUESCENCE. Sometimes called "salt petreing"; see GYPSUM; PARIAN CEMENT; SAND.

SALT WATER; see WATER. OXIDATION.

SALUCCI (GIO...), 1826 designed the palace of Rosenstein,

near Stuttgart, for the king of Wurtemberg. Plans, etc., with a plan of the park by Bosch and Salucci, are given in ALLGEMEINE BAUZEITUNG, 1838, pl. 196-8, text 109; 128: it is described in LOUDON, *Encyc. of Gardening*, edit. 1850, p. 135-6. He died in 1848. PONSI, *Memorie*—di G. S., 8vo., Flor., 1850, has not been seen.

SALUTATORIUM; also called ASPATICUM. A place adjacent to the ancient basilica or church, arranged for receiving visits of devotion or business by the clergy. THEODORET, v, 18; BINGHAM, *Origines*, ii, 471, 474. 80.

SALUZZO. A large town and bishop's see in northern Italy. The old castle, once the residence of the marquesses of Saluces (extinct 1548) is now a prison; a handsome cathedral dedicated to the Assumption of the Virgin, dating from 1480; restored 1849; other good churches; a bishop's palace; a royal college; and a statue 1863 of Silvio Pellico born here 1789, are noticeable. 14. 28. 50. 96.

SALVADOS DA BAHIA (SAN); see SAN SALVADOS.

SALVART (JESSON, JESON, JESSON, JEHAN), was 13 March 1398 appointed master mason to Rouen cathedral on the death of Jean de Bayeux, with a salary of 6 livres tournois; 1407 he replaced the decoration of the grand portail; 1419 for Henry V of England, built a large fort or palace, near the city; 1424-28 the library of the cathedral; and 1430 enlarged the upper windows of the choir. He was succeeded 21 Sept. 1447 by Colin Duval. DEVILLE, *Revue des Architectes*, 8vo., Rouen, 1848, p. 26, 38, 80.

SALVAT (PEDRO), flourished 1310 at Minorca or Mallorca.

SALVESTRO; apparently an error in VASARI, for FANCCELLI (L.).

SALVETTI (GIUSEPPE), at Florence, 1787 modernised the spedale de S. Giambattista or di Bonifazio (the church later by G. B. Pieratti); (*Rigolamento*—*spedale di S. Maria Nuova e di Bonifazio*, 4to., Fir., 1789): 1787 modernised the conservatorio delle signore Montalve, via della Scala No. 4347; and 1789 restored, with new columns, the loggia of the hospital for convalescents, designed by F. Lapi, now the scuole di S. Paolo, in the piazza di Sta. Maria Novella; elevation in FAMIN ET GRANDJEAN, *Arch. Toscane*, fol., Paris, 1846, pl. 83. FANTOZZI, *Guida di F.*, 1842.

SALVI (DIOTI), or DIOTISALVI; see PETRONI (D. DE').

SALVI (GASPARO), died December 1849 at Rome. REUMONT, *Beitrage zur Ital. Geschichte*, 8vo., Berlin, 1853-7, ii, 345.

SALVI (NICCOLO), born 1699 at Rome, studied under A. Cannevari. He designed for fireworks a temple to Glory 190 ft. high, having four façades of architecture in relief, over the Baraccia fountain in the Piazza de' Spagna, without opening the ground. On his master going to Portugal he left all his works at Rome to Salvi; who repaired the baptistry of S. Paolo without the walls; designed the high altar in S. Eustachio; the little church at the villa Bolognetti, outside the porta Pia (PERCIER ET FONTAINE, *Maisons de Plaisance*, fol., Paris, 1824, pl. 50-51); the altar of S. Niccola in SS. Lorenzo e Damaso; the rich ciborio or pyx for Monte Cassino; and *cir.* 1745, the church of Sta. Maria di Gradi for the Dominican monastery at Viterbo, the works being directed by A. Asprucci. In 1735-48 he restored and decorated the magnificent fontane de' Trevi for pope Clement XII (previously restored for Nicolas V by M. Luzzi), at the end of the acqua Vergine: LETAROUILLY, *Rome Moderne*, fol., pl. 347-8; text 710-2; FORSYTH, *Italy* in 1802-3, 4th edit., 1835. His many unexecuted works are noticed in the publications referred to. Among his pupils were signor Giansimone of Rome, C. Murena, and A. Asprucci. Afflicted with paralysis he died in 1751, aged 52. Q. DE QUINCY, *Vies*, App. SELVATICO, *Scultura*, appears to have used the name four times of Salvi for Sardi, in p. 422-8. The Add. MS. 8503 in Brit. Museum is entitled *Memorie spettanti alla fontana di Trevi, fra le quali alcune tratte dagli originali di Niccola Salvi*, by Filaretto (?): *Riflessioni sopra la vita di N. S. stampate nelle vite degli Architetti scritte da Anonimo*, by Papirio Loto (?). 3. 12. 25. 34.

SALVIATI; IL, or **FRANCESCO ROSSO**, son of M. A. Rossi, born 1510 at Florence, studied under A. del Sarto and B. Bandinelli, was a fellow student of G. Vasari, who highly praises his works of painting architectural accessories. He was master of A. Lippi, and of GIUSEPPE PORTA, detto Salvati, and died 1563 at Rome. *PILKINGTON, Dict.*; *BRYAN, Dict.* 14. 20. 73.

SALVIN (ANTHONY), F.S.A. 1824; F.I.B.A.; born 17 Oct. 1799, was son of general Anthony Salvin of Sunderland bridge, Durham; became a pupil of John Nash; commenced practice 1826 in his native county and continued until about two years before his death, December 1881 aged 82 at Hawksfold, Fernhurst, near Haslemere, Sussex. A long chronological list of his designs is given in *BUILDER Journal*, 1881, xii, 809-10; and a selection in *ROYAL INSTITUTE OF BRITISH ARCHITECTS, Sessional Papers*, 18 May 1863, when he received the royal gold medal. His son ANTHONY, F.I.B.A., also died in 1881.

SALY (JULES DE), architect to the chamber of commerce at Paris, was 1846 elected a member of the imperial academy of fine arts at S. Petersburg.

SALZBURG (anc. Javavin, and Jovavum, Hadriana, and Petraja; destroyed by Attila in 448; Ital. *Salisburgo*). A town since 1805 or 1814 in Upper Austria; situated on the river Salzach, over which is a timber bridge above 370 ft. long. The town is walled and has eight gates; a fine castle, founded XI cent., now used for barracks, with a torture chamber and obelisk in one of the towers: the archbishop was also a prince of Salzburg and of the German empire, lasting 1200-1802. His apartments in the castle date from before 1519, were restored 1851; the chapel dates 1502.

The cathedral dedicated to SS. Rupert and Virgilius, was carried out 1614-68 by S. Solari of Como from the model and complete set of drawings prepared by V. Scamozzi at Venice. It is of white marble, 410 or 466 ft. long (360 Vien. ft.), 250 ft. wide (150 ft.) and 109 ft. (220 ft. ?) high, and had a dome (which with the roof was burnt 1859) and two west towers. The fine bronze font is dated 1321; the outside iron railing 1675. G. A. P., *Kurze Geschichte des Salz. doms*, 8vo., Salz., 1859. Of the twenty-six churches, the chapel of S. Rupert at the entrance of the *klaue* is said to be of Merovingian date. The *stiftskirche* or collegiate church of S. Peter has an arched narthex, dated 1127-31 according to KUGLER; and 1200-10 to MERTENS; also a white marble fountain. The nave of the parish church somewhat resembles the old portion of S. Stephen at Vienna. The university church of the Virgin 1696-1707 was by J. B. Fischers. Old Franciscan church, round arches in nave 1230-60; choir rebuilt 1470 has five shafts, 4 ft. diam. and 70 ft. high (*Jahrbuch der Central Commission zur Erhaltung der Baudenkmale*, ii, 37). Cajetan church, a rotunda, is by Zugali of Munich. Benedictine church, xv cent., one of the oldest in Germany, has a large library, and glass dated 1480. Sebastian church was rebuilt after 1818. The cemetery has a number of curious ancient tombs; its iron gate is in HEFNER ALTENEK, *Serrurerie*, fol. 1869, pl. 71; and that of the tomb to the Zillner family, pl. 50; the curious *Aegidius kapelle* begun 1127, was greatly mutilated in xviii cent.

Among other noticeable works are, the rathhaus; residenzschloss 1592; hauptwache and its bells; bathing establishment 1866-68 by F. R. Bayer of Vienna (*ALLGEMEINE BAUZEITUNG*, 1872, pl. 70-5, text 353-4); and the bath house by Bayer and Thienemann. 1607 stabling for 130 horses, 144 ft. long, now cavalry barracks; 1693 the summer riding house 110 paces long, has three galleries hewn out of the rock of the Mönchberg; *cir.* 1750 or 1767 the Sigismunds thor, a tunnel 415 ft. long, 22 ft. wide, and 39 ft. high, cut in about two years through the rock of sandstone breccia; at one end is a statue of the archbishop, 16 ft. high: 1664-8 a richly carved fountain, 45 ft. high, of white marble from the Untersberg; 1771 bronze statue of the Virgin by Hagenau; 1842 statue of Mozart by Schwanthaler.

The pleasure house called Klessheim, Clesheimb, or Cresheimb

for the archbishop, by J. B. Fischers, is engraved in his work. The Mirabell (it was rebuilt after the fire 1818), etc., gardens, and the Hellbrunn gardens 1613 near the town, are given in DIESELS, *Gardens, etc.*, fol., *cir.* 1720. Roman mosaic pavements found 1841 are described in *ALLGEMEINE BAUZEITUNG*, and *CIVIL ENGINEER, etc., Journal*, iv, 366; Roseneggers' private museum of Roman antiquities dug out 1834 at Biergalstein, was described in 1817 (? 1837).

Seventeen plates of the buildings, etc., by Peret and others, fol. (1682). *Salzburg Illustriert*. POPPEL UND LOESER, *Salz. und seine umgebungen*, 8vo., 1846. *Ansichten der stadt Salz.*, by E. Adam, eng., T. Helmuth, 3 pts., 18 pl., fol. Mun., 1837. *Reise durch Salz.*, 2 vols., 8vo., Duss., 1840-42. *Salz. und seine Umgegend, etc.*, 12mo., Salz. (1853). *Salz. die Stadt und ihre umgebung*, 12mo., Salz., 1854. *BUILDER Journal, Going Along*, 1863, xxi, 749. KUGLER, *Geschichte der Baukunst*, vol. v by Lubke, 8vo., 1872.

Alfridus, a priest of Salzburg, flourished between 859-873 (26); and S. Rupert, *cir.* 800 taught artists in the monastery. J. G. Laschensky practised 1810. L. Grenier 1774-1811 undertook alterations in the winter palace, in Mirabell, at Hellbrunn, Klessheim, etc., and conducted the erection of the new episcopal palace. Meister Hans was baumeister at "the church", *cir.* 1410-32. J. Grabner practised 1696-1707 as court architect (26). 14. 26. 28. 50. 92. 96.

The red Salzburg marble was used for columns in the royal chapel at Munich 1826-37 by L. von Klenze.

SALZDORF or **SULZDORF** (HANS VON); see NOERDLINGEN.

SALZENBURG (W.....). His name appears with others on the title-pages from 1838 to 1842 of *Architektonisches Album*, fol., Potsdam. He published *All-Christliche baudenkmale von Constantinopel von v. bis xiii jahr*, fol., Berlin, 1854; and for this work the silver medal of the Institute of British Architects was awarded to him May 1855. He designed 1860-62 the grand gothic hall to the rathhaus at Münster when the building was restored by him.

SAMARCAND (Maracanda, capital of Margiana; ARRIAN, *Anab.*, iv, 3). A city of Bokhara, in Asia, nearly quadrangular in form, situated near the river Zer-afshan. It has six gates, with a citadel which contains the emir's palace, on the west side. It was of great extent and celebrity in XIV cent. as the usual residence of Timour (b. 1335, d. 1405), but declined at end of xv cent. when the residence was taken to Bokhara. The jasper tomb of Timour is in a lofty domed octagonal edifice ornamented with agate; three quadrangular medressehs with mosques of his period; and that of Sheredah, are of interest. Four caravanserais and a bazaar of considerable extent, are modern. Outside the north walls the palace of Timour still forms an extensive and magnificent ruin. White marble quarries in the neighbourhood are worked. GIBBON, *Decline, etc.*, edit. 1855, vi, 21; 358; 380; vii, 122; 162-6; 186. SLEEMAN, *Rambles, etc.*, 8vo., London, 1844, ii, 255. DE BODE, *Khanikoo's Bokhara*, 8vo., London, 1845, p. 128. BURNES, *Travels* (who did not see the town), 8vo., 1834. HOWORTH, *Mongols, etc.*, 8vo., 2 vols., London, 1876, etc., pt. i, p. 79; pt. ii, div. 2, p. 689, 694-8, *cir.* 1200-1500. VAMBÉRY, *Bokhara*, 8vo., 1873; and *Central Asia*, 8vo., 1864. 14. 50. 96.

SAMARIA; the modern SEBASTE.

SAMAROBRIVA or **SOMAROBRIVA**; the modern AMIENS.

SAMBICHE, a mistake for Cambiche, CHAMBICHES, or Chambiges; there appear to have been five of this name, MARTIN, JEAN, Pierre, and his son Pierre; and Loys. BERTY, *Les Grands Archts. Franç.*, 8vo., Paris, 1860.

SAMBIN (HUGUES DE), "architecteur" in 1554 to the city of Dijon, is considered to have designed the new church of S. Michel, consecrated 1525, the centre tower being stopped at the siege of 1513; MAILLARD DE CHAMBURE, *Voy. Pitt. en Bourgogne*, fol., Dijon, 1830, i, 60, etc. He published *Ouvre de la diversité des termes (Caryatides) dont on use en Architecture*, fol., Lyon, 1572, and 1576 (76 pages plus un feuillet avec la date à

la fin), now very scarce; A. F. DIDOT, *Essai—sur l'histoire de la gravure sur bois*, 8vo., Paris, 1863, col. 263, attributes the woodcuts to Michael Angelo, of whom Sambin was a pupil. 5.

SAMBUCUS, the Elder tree. Its wood is sometimes used for fences. It thrusts itself between the joints of stones of old buildings, doing more mischief than ivy, or the fig tree of warmer climates; *BUILDER Journal*, 1861, xix, 274. CHILIANTHUS, wild Elder tree.

SAMEL, SAMILE, SAMNEL, SAMMEL, and SANDAL BRICK. "The brick that lies outmost in a kiln or clamp, and consequently is soft and liable to moulder, as not thoroughly burnt;" *CHAMBERS, Dictionary*, fol., 1786.

S. P., or PRIMATT, *City and Country Purchaser*, etc., 8vo., London, 1667, states they are to be specially avoided, not even to be used in the *choir of the foundation*; *BUILDER Journal*, 1859, xvii, 577. LANGLEY, *Builders' Prices*, 8vo., London, 1750, p. 1-3; 124. 4.

SAMMICHELI (MICHELE); see SANMICHELE (M.).

SAMOS of Ionia. Once among the strongest and most flourishing cities of Greece, situated near Megale Chora, the present capital of the island. Only a single column of the Doric order remains of the largest of Grecian as distinguished from Sicilian temples, one, too, probably of the oldest of the great ones; FERCUSSON, at Royal Inst. of Brit. Archts., *Sessional Papers*, 22 Jan. 1877, p. 92; and *The Parthenon*, 4to., 1883, p. 28-9. It was dedicated to Rhea, Hera, or Juno; is supposed to have been 346 ft. by 189 ft. (LEAKE, *Asia Minor*, 8vo., 1824, p. 348), or 344 ft. by 166 ft., with a diameter of the outer columns of 6 ft. 5.4 ins., the flutings were incomplete; SOCIETY OF DILETTANTI, *Antiq. of Ionia*, fol., 1821, pt. i, ch. 5, pl. 59, eight plates. Its first architect was RHŒTUS, of Samos, with his son THEODORUS, B.C. 640-600. The bronze statue of Juno existed in the square at Constantinople until A.D. 1200. The site of the city is still untouched by the spade. AQUEDUCT, p. 4.

HERODOTUS, *Thalia*, iii, 60. POCOCKE, *Travels in the East*, 1743-45, gives a plan. CHOISEUL GOUFFIER, *Voy. Pitt.*, 1782, i, pl. 53-4. TOURNEFORT, *Voy. au Levant*, 1717, i, 406, gives a cap and base. ALLAN, *Pict. Tour*, 1843, p. 34. PANOFKA, 1822. ROSS, *Reisen*, 1843, ii, 139-155. GUÉRIN, 1856. DALY, *Revue Générale*, 1857, xvi, 67; 158. 3. 7. 14. 23. 28.

SAMPSON (GEORGE), 1732-6 designed the first portion of the bank of England, Threadneedle street, of which the façade exists (1883) in the courtyard: "June 5, 1734, business was first transacted in this building." The designs are in Sir John Soane's museum. CROWLE'S PENNANT, at British Museum, xii, 88, 90, 98. MALTON, *Pict. Tour in London*, etc., fol., London, 1792, pl. 63.

SAMSOON, in Asia Minor; see PRIENE.

SAMUEL (.....), put up 1668 to succeed E. JERMAN in the rebuilding of the royal exchange, London.

SAMUELE (...), designed the palazzo Contarini a S. Samuele, at Venice; CARLEVARI, *Fab. di Venezia*, fol., 1703, pl. 70.

SAMYER (ESTIENNE), 11 Sept. 1513, was master of the works at Bethune; *Calendars of State Papers*, 5 Henry VIII, 8vo., 1862, p. 669.

SANATORIUM. A building erected in the country to assist in the cure of diseases by affording change of air and scene to the invalid, together with medical attendance. All hospitals, etc., are sanatory institutions. The famous English sanatorium at Ootacamund, in Malabar, to which all who can manage it escape from the summer heat in the Madras Presidency, is upwards of 7,000 ft. above the level of the sea. A sanatorium for the city of London hospital for diseases of the chest, Victoria park, 200 ft. by 72 ft., designed by J. Paxton, is given in ILLUSTRATED LONDON NEWS, July 5, 1851, xix, 12. West of England San. at Weston-super-Mare, by H. F. Price; *BUILDING News Journal*, 1871, xx, 428. At Brighton, Aug. 1881, a large timber building cost £5,000=new one to cost £15,000. At Virginia Water, for Thos. Holloway, by W. H. Crossland; *BUILDER Journal*, 1875, p. 645-7; 1877, p. 712; 1882, xlii, 23.

Convalescent Home at Sandgate, *BUILDER Journal*, July 14, 1883, p. 39-40. At the Reclham Asylum for Fatherless Children, by T. Roger Smith, *BUILDER Journal*, July 1883, p. 57.

SAN CASCIANO (MAESTRO PIERO DA), "a tolerably good master" always employed as a builder by the house of Medici; constructed for Cosimo, duke of Florence (1537-74), the aqueduct from Castellina to the villa Castello, near Florence, decorated by Tribolo; and died on its completion. VASARI, *Lives*, edit. 1851, iv, 190-5.

SANCHEZ (BENITO), master of the works at the cathedral of Ciudad Rodrigo in Spain, erected by king Ferdinand II of Leon (1157-88), the design of which is attributed to him, together with part of the cloister in which he was buried 1190. 66.

SANCHEZ (FELIPE), designed the celebrated elliptical pantheon or sepulchral chapel for the duke dell' Infantado, in the church of S. Francisco at Guadalaxara; its completion with the small chapel annexed was effected in 1728 by F. della Piña, master of the city. 3. 66.

SANCHEZ (DON FRANCISCO), born 1737 in the locality of San Garcia, near Segovia, was one of the most ingenious disciples of don V. Rodriguez. Early showing a good taste, the academy of San Fernando gave him one of its prizes as a means of studying at Madrid, where he made drawings of edifices still preserved in the public architectural hall for the instruction of the youths. His chief works were directing the laying out of the puerta del sol with the Prado, under J. Hermosilla (died 1776), ILLUSTRATED LONDON NEWS, 1846, ix, 248; designed about 1769 the cupola and the chapel of the Holy Cross of S. Ginés; the high altar of the third order of S. Francis the Great, and the church and retablo of our Lady de la Soledad in la calle de Paloma; the house of the duke of Hijar, also several houses for the grandes of Spain, and for private persons: the gate of the garden of the marquis of Monteleagre near to the Recoletos; with two covered wells in this locality; the episcopal palace in the island of Minorca; part of the galleries in the university at Alcala; two houses near those of the duke de Medina Celi in Leganés; and various other works. He succeeded V. Prieto as master of the works at the puente de Toledo over the river Manzanares, which he completed. He was director in 1786 of the academy, and maestro mayor of the city of Madrid. 66.

SANCHEZ (JUAN), maestro mayor of the city of Seville, 1545-56 directed the works of the casa de ayuntamiento, and was consulted on the works of the hospital de la Sangre, completed 1564; B. de MORALES and A. BERRUGUETE. 66.

SANCHEZ (SIMON), 1576 maestro destajista at the work of the church at the Escorial. 66.

SANCHEZ BONIFACIO (MARTIN), 1481-4 maestro mayor at Toledo cathedral, executed the portal or façade of the old sacristy. 66.

SANCHEZ DE ALVARADO (JUAN), 1531 a celebrated mason (*cantero*) and architect of Salamanca cathedral, made the pillars of the nave, under Juan Gil, master of the works. 66.

SANCHEZ SARABIA (DON DIEGO); see HERMOSILLA (J.).

SANCHI, near Bilsah, in Central Hindostan. The tope erected B.C. 250, about the time of Asoka, one of the finest and most perfect in India, was dug into in 1819 by Sir H. Maddock. It is one of the few records of the Buddhist religion. The principal portion consists of a dome 106 ft. diam. and 42 ft. high, on the top is a platform 34 ft. diam., on which stood a Tee surrounded by a stone railing of which portions remain. The dome rests on a pedestal projecting 6 ft. and 14 ft. high and 120 ft. diam. The centre is solid, the surface was of stone coated with cement 4 in. thick. The fence around the tope consists of stone posts 8 ft. 8 in. high, 2 ft. apart, a plain top rail 2 ft. 4 in. deep; and between the posts are three elliptic stone rails 9 in. thick. Four curious torans or gateways, about 33 ft. 6 ins. high, are of the early part of the first century of the Christian era, the south one dating A.D. 10-28, the north one the largest and finest, the east one (cast in South Ken-

sington museum), and the west one, date about 100 to 150 A.D. CUNNINGHAM, *Bhilsoa Topes*, 1854. FERGUSSON, *Pict. Illust. of Hindostan*, fol., London, 1847, title and page 21: his *History of Art*, 1867, ii, 463-5; his *Tree and Serpent Worship*, 8vo., 1868, also fol. pl., 1868, giving several details; and his *Indian and Eastern Architecture*, 8vo., 1876, cuts p. 97. BUILDING NEWS *Journal*, xix, 1870, p. 477. PAILOO. INDIAN ARCH. (p. 23). MARK (mason's).

SANCHO (MARTIN), an architect, in 1459 carved out of one stone the Gothic portal of the church of S. Bartolomé de Olaso in Elgoibar, in Guipuzcoa; the pillar in the middle had a statue with others at the side; it still exists, while the church was destroyed in the XVII cent. 66.

SANCTA SANCTORUM and sanctum sanctorum. The Holy of Holies, the most sacred part of the temple at Jerusalem, containing the ark of the covenant, into which part the high priest only was allowed to enter and that but once a year. In both ancient and modern times the term is synonymous with SACRARIUM and SANCTUARY. CELLA. Two passages are quoted from MARTENE, *Ant. Eccl. Rit.*, fol., Venice, 1783, respectively i, 187, and iv, 141, in the *ECCLESIOLOGIST Journal*, 1849, ix, 166 and 170; which p. 171 show that the term in the same authority, iii, 66 and iv, 297 *app.*, is susceptible of another meaning, viz., "the depository of the blessed sacrament", which he derives from the same source (iii, 67), and applies to a quotation from iv, 48; thus they do not constitute a good substitute for the word SACRARIUM in the sense of "the third and holiest portion of the church". 19.

SANCTIS (FRANCESCO DA), of Rome, designed the staircase of 135 steps at the church (restored by Mazois) of the Trinità de' Monti; also 1614 the façade to the church (built 1614 by P. Maggi) of the ospizio della Trinità de' Pellegrini. LETA-BOUILLY, *Rome Moderne*, fol., Paris, text, 4to., 1840-50, p. 154; and fol., 1825-60, pl. 9. 3.

SANCTIS (GIACOMO DE), was a pupil of S. Masuccio II (who died 1387), and to whom some of the following works at Naples are attributed. 1324 he completed with Maglione the church of S. Lorenzo, with the vast stone arch separating the nave from the crossing; designed 1327 the monastery and church della Croce de Palazzo; began 1325 the magnificent Carthusian monastery of San Martino, attributed to Cino di Cenis with F. de Vite (church rebuilt by C. Fausaga); 1328 the lower part of the CAMPANILE (*Detached Essays*, s. v., p. 4, woodcut) of the church of Sta. Chiara; 1344 the church of S. Giovanni a Carbonara; 1343 the torre Belforte (in the castel Sant' Erasmo, founded XIV cent.), the commission for which still exists (MURRAY, *Handbook*, edit. 1875); the torre was altered 1458-94 when it was called castello di S. Martino, and it is the nucleus of the later castel Sant' Elmo (NAPOLI): *cir.* 1350 he designed the palazzo Avellino, part of which was 1616 rebuilt larger; and *cir.* 1350 the supposed palazzo Balzo, later Petrucci, in the piazza di S. Domenico Maggiore, except the portal by Aniello; it was altered 1698 for the bank of S. Salvatore, and is now belonging to the Galbiati family. The church of Sta. Maria delle Grazie sopra le mura, near S. Agnello, is given to him with the date *cir.* 1450, but MILITIA, *Vite*, states he died in 1435, which appears to be late when compared with the dates of the works above named. 3.

SANCTO TRUDONE (GERHARD DE), van Sint Trond, and magister Gerardus, worked at Cologne cathedral 1254-95; see KETTWIG (G. von).

SANCTUARIUM. This word, used in the rituals of conventual churches, seems to have been employed as equivalent to *presbyterium*, or the eastern part of the choir of a church, in which the altar was placed; wherefore *gradus sanctuarii* and *gradus presbyterii* alike meant the *gradus chori*, or steps from the choir to the presbytery or precinct of the altar: ADAM BREMENSIS. DUCANGE illustrates his definition of Sanctuarium Altaris, Gr. *ἀδύρων*, *βήμα*, Lat. *presbyterium*. But there is another signification of *Sanctuarium*, which is given by DU-

ARCH. PUB. SOC.

CANGE, viz., "relics of saints, or rather the case containing such relics", where his words "thea reliquiarum" might be rendered either a *shrine* or a reliquary. In view of the above meaning, the word *sanctuary* was proposed instead of SACRARIUM in the *ECCLESIOLOGIST Journal*, 1849, ix, 173-5, 275-281.

A canopied sanctuary and sanctuary screen, forming a BALDACHIN to the altar, occur in the churches at Brilley and Michael-church, Herefordshire. Another such screen is seen at the cathedral of S. David; *CHURCH BUILDER Journal*, 1867, p. 127-8.

SANCTUARY. A place of refuge during the ancient and mediæval periods to criminals. The sanctuary embraced not only the altar, but the building, and some distance beyond; as at Ephesus, where the temple of Diana had its sanctuary or asylum by successive privileges spread two stadia around it; this was abridged by the Romans. The rights of sanctuary of S. Julian at Brivas or Brioude after an assault A.D. 536 was extended by Childebert five miles around the sepulchre of the martyr: GIBBON, *Decline*, edit. 1854, iv, 200, who ii, 379-80, states that FRA PAOLO, iv, 192, etc., "gives an excellent discourse on the origin, claims, abuses, and limits of sanctuaries. Ancient Greece might contain perhaps fifteen or twenty *azyla* or sanctuaries; a number which at present may be found in Italy within the walls of a single city". COD. THEOD., lib. 9, tit. 45, leg. 4. The sanctuary of the Gens Julia at Bovillæ on the via Appia. The sanctuary "do Monte" near Braga in Portugal is the most sumptuous in the country.

On the north side of S. Margaret's churchyard, Westminster, east of the almonry, stood a building called "the sanctuary", supposed to have been erected by king Edward the Confessor. It was of great solidity, square in form, and had on each of its two floors a cruciform apartment, the angles forming small rooms; it was pulled down 1750; STUKELEY, in *ARCHÆOLOGIA*, 1770, i, 39-41 and plate: ALLEN, *London*, 8vo., 1828, iv, 208. PEGGE, *History of the Asylum or Sanctuary, to its final abolition in the reign of James I* (21st, cap. 28), *ARCHÆOLOGIA*, 1787, viii, 1-44. STAVELEY, *History of Churches*, 2nd edit., 1773, p. 165-77. FOSBROKE, *Brit. Mon.*, 363; 451. KEMPE, *S. Martin's-le-Grand*, 1825. *The Right of Sanctuary*, in *GENTLEMAN'S MAGAZINE*, 1867, 324; 647. PICTORIAL HISTORY OF ENGLAND, 1841, iii, 761. WALCOTT, *Memorials of Westm.*, 8vo., London, 1851, p. 80-7. ANCHORAGE. 19.

SANCTUS (BAROLOMÉ), maestro mayor at Jerez de la Frontera, was employed 1575 at the citadel. OLIVA (D. M. DE). 66.

SANCTUS AMANTIUS. The Latin name of Saint CHAMAS, in France. 2. 25.

SANCTUS BELL; also sancte, saints', saunce, sance, sacring, sakring, and mass, bell. (Ger. *dach-reiter*, the bell cot often seen marking the choir.) A small bell formerly rung out in a church when the priest came to the words, "Sanctus, Sanctus, Sanctus, Dominus Deus Sabaoth" in the service, so that those who did not attend the church might know the time when the words were said. It was usually fixed in a turret on the roof over the chancel arch, with the rope passing through into the choir near the altar. A handbell carried by an attendant is now generally used. DU CANGE, s. v. Rota, mentions a wheel full of small bells, which was attached to the wall near the altar and whirled round at the reading of the passage. As stated in LOW SIDE WINDOW, "the use of the sancte bell, often found suspended in a small niche at the east end of the nave, is either preceded or superseded by this opening". The fine churches of the Franciscan and Dominican orders often exhibit only this adjunct, to which the Cistercian order is restricted, for a belfry. The bell cot still remains at Boston, Lincolnshire; Prestbury, Cheshire (1883); Over, Cambridgeshire; Gillingham, perfect; and portions at Methwold, Norfolk; Isham, Rothwell, and Desborough, Northamptonshire; Bloxham, Brizenorton, Swadcliffe, Crombe, and Kiddington, Oxfordshire, where at the latter church the west tower had three bells and a sanctus bell; at Gawsworth church, Cheshire, *temp.* end of Henry VII, the cot and gable

cross are combined, as shown in *ARCHITECT Journal*, 1849, i, 108. The usual BELL COT is a different structure.

The original sanctus bell remains on the roodscreen at Sallhouse, Norfolk, a very unusual position; and over it at Hawstead, Suffolk (NOTES AND QUERIES *Journal*, Dec. 12, 1857, 2 s., iv, 481). At Diss, Norfolk, it hangs in a turret, and was very recently rung every Sunday to warn the congregation of the approach of the minister: it exists at Long Compton, Warwickshire. At Liddington church, Bedfordshire, is one 12 ins. diameter, it bears the word "Petre" with a founders' stamp. One was found in a putlog hole at Bottesford church, Brigg, Lincolnshire; ASSOCIATED SOCIETIES, *Reports, etc.*, 8vo., 1870, p. 236. NORTH, *Church bells of Northamptonshire*, 4to., Leic., 1878, p. 136. NORTH, *Church bells of Lincolnshire*, 4to., Leic., 1882, p. 195. 17.

SAND (Lat. *arena*; It. *sabbio*; Sp. *arena*; Fr. *sable*; Ger. *sand*). A mineral substance in a granular state insoluble in water. Its use in building is chiefly as an ingredient in MORTAR, and in CEMENT; and with gravel, in CONCRETE. The three qualities chiefly used are *river, pit, and sea, sand*. Sand is considered best when *sharp*, that is angular not round, and *clean*, that is free from all earthy matter. When sand is obtained from a running clear stream it is usually clean and not so connected with clayey or muddy particles, as when obtained from fouler streams. Even the "sharp drift sand" of the river Thames, of high repute with London architects, now often requires to be screened and washed. River sand is better suited for inside plasterer's work. ROAD DRIFT.

If *pit sand* only can be procured, it must be repeatedly washed to free it from all earthy and clayey particles usually contained in it, until it looks clean and feels gritty under the fingers. SMEATON, *Eddystone Lighthouse*, fol., London, 1793, § 216-22, on the use of sand in mortar: who, with HIGGINS, *Calcareous Cements*, 8vo., 1780, § 12, recommends the use of clean coarse and fine sands together. Pit sand is stated by VITRUVIUS to be too strong for plastering, causing it to crack while drying: he allows three parts of pit sand, or two parts of river sand, to one of lime for mortar. Some writers consider the grains of pit sand to be better than river sand as being more angular, and therefore the lime obtains a better hold upon them.

Sea sand, having a coating of chloride of sodium which combines with the lime forming chloride of calcium, must be well washed several times in fresh water to entirely remove the saline particles, otherwise the mortar or cement will be long in drying, as noted in VITRUVIUS, 2, iv. If any salt be left, the walls in dry weather will show an efflorescence; this, when the air is damp, will collect moisture, causing the wall to look wet, and may be the cause of introducing rot to the timbers. SMEATON, § 184, notices that he was informed by masons "that mortar mixed with saltwater would never harden in so great a degree" as if made with fresh water. BUILDER *Journal*, 1865, xxiii, 665. CIVIL ENGINEER, *etc.*, *Journal*, 1849, xi, 30. WILSON, *Essay on Sea Sand*, 8vo., Edin., 1848. BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 118. PASLEY, *Limes, etc.*, 8vo., London, 1838, § 9, 25, 26, 34, 39. DELIQUESCENCE. EFFLORESCENCE. LIGHTHOUSE, wherein is shown the annoyance from use of sea sand in mortar. The "enamel paint" of the Silicate paint company is said to be the only remedy, it being unaffected by the strongest brine; another is washing sea sand in dilute oil of vitriol so as to separate the salts from the siliceous particles, pouring off the fluid, and washing again twice or more in fresh water, as recommended in BUILDER *Journal*, 1853, xi, 220.

In experiments made with *Portland cement*, and "clean Thames sand", "very clean pit sand", and the "same pit sand washed", the pit sand gave somewhat higher results than the trials with the first; with "an inferior or loamy pit sand" the result was similar to the use of Thames sand, and in another proportion of cement it was superior to Thames sand. The washing of pit sand seemed to add about 35 per cent. to the strength at the end of a week, but at the end of a month it was not so satis-

factory; with washed pit sand it was 46.2 per cent. above the first specimen of Thames sand, or 31.21 per cent. above the same sand when not washed; GRANT, *Strength of Cement*, in INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1865-6, xxv, 71-2. In another trial the strength was 611.5 for Thames sand, 1078 for clean pit sand, 831 for loamy pit sand, and 1075.7 for the neat cement; p. 74. In the succeeding paper, xxvi, p. 279, GRANT showed that by the admixture of sand or gravel, cement mortar, or concrete, sets less rapidly than neat cement.

A "metallic sand" for cement was introduced about 1843 in coarse or fine powder. It was used in the foundations of the houses of Parliament, the tunnels of the Birmingham railway, for malt house steeping troughs and floors, for stucco work, and other purposes. I.

"Silver sand" is sometimes used in the setting coat of plasterers' work. Glass grinders' sand is sometimes used.

Refuse sand from an iron foundry used with lime is said to prevent the discoloration and bleaching of stone, and decay, as it contains protoxide of iron; BUILDER *Journal*, 1855, xiii, 10. In mortar it gives extra strength, acting something like puzzolana.

The bye-law of the Metropolitan Board of Works, under Act 1878, Sect. 16, requires that "the mortar to be used must be composed of fresh burnt lime and clean sharp sand, or grit, without earthy matter, in the proportions of one of lime to three of sand or grit." SETTING.

SAND is sometimes used as a bed (Fr. *forme*) in setting bricks, stones, etc., in paving. Also as a filling-in substance; BUILDER *Journal*, 1833, xlv, 393. SOUND-BOARDING.

SAN DALMATIUS; see DALMATIUS (SAN).

SANDAL WOOD, *Santalum album*. A tree of Hindostan having the appearance of a large myrtle. The wood has an agreeable fragrance, which is a preservative from insects, and it is therefore used in making workboxes, small cabinets, etc. When pulverised it is used as incense. BUCHANAN, *Mysore*, 4to., London, 1807; 1812; Index, s.v. Its colour is a yellow-brown. The famous "sandal wood gates of Somnath" are now decided to have been made of the Deodar pine. Saunders or red sandal; see PTEROCARPUS. *Adenanthera pavonia*, another dye wood, also called red sandal wood, is one of the largest trees of India, there called *Rukta-chandam*. 23. 71.

SANDARACHA. A colour obtained by the ancients from gold and silver mines, varying in shade between red and yellow, the former was most esteemed. When roasted with an equal proportion of red lead, it made the colour called "sandyx", of a dull hue, which when mixed with "sinopis" was called "syricum". This was chiefly used as a ground colour. When finished with a coat of "purpurissum" laid on with white of egg, it counterfeited "minium" or "cinnabar"; when "ostrum" was laid on with it, it made a purple. LIBRARY OF ENTERT. KNOWLEDGE, *Pompeii*, 8vo., 1832, ii, 56-58. Sandarach is now supposed to be red sulphuret of arsenic, or Realgar.

SAND BAG. A small sack filled with sand upon which the support of centring rests; when it is necessary to strike or ease the centring, the sack is pierced and the sand escapes. The arch thus settles upon its bearings more gently than by using wedges. DALY, *Revue Arch.*, xii, 303. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1859-60, p. 35.

SAND BLAST. A process for producing architectural ornaments, or for engraving or cutting inscriptions in stone, marble, slate, wood, etc.; also for ornamenting or decorating glass. The process was described by Newton, C.E., at the SOCIETY OF ARTS, *Journal*, 1875. BUILDER *Journal*, 1875, xxxiii, 228, noticing Tilghman's patent sand-blast company.

SANDBY (THOMAS), R.A., born 1721 at Nottingham, came to London, 1743 appointed draughtsman to the chief engineer in Scotland, 1745 at fort William, accompanied in a like position the duke of Cumberland to Flanders, and 1746 was appointed by him deputy ranger of Windsor Great Park, which he held for fifty-two years, living at Frost's lodge (pulled down and rebuilt

by J. Nash for king George IV). In 1754 as architect to king George II he planned Virginia water (the largest artificial lake in the kingdom), with its embellishments, and formed the cascade, and published eight views of his alterations. In 1755 he was one of a committee to consider a plan for the foundation of a public academy; 1765 joined the Incorporated Society of Artists of Great Britain, became 1768 an original member of the Royal Academy, and its first professor of architecture; a MS. volume of his lectures dated 1768 is in the library of the Royal Inst. of British Architects, presented by John Britton, and another in Sir John Soane's museum. In August 1759, when the so-called Holbein's gateway at Whitehall was taken down, the duke of Cumberland had every brick marked and removed to Windsor for re-erection (not carried out) at the end of the Broad Walk, with addition at the sides designed by Sandby, as shown in SMITH, *Antiq. of Westminster*, 4to., London, 1807-9, pl. at p. 22; CUNNINGHAM, *Handbook*, 552. In 1769 he gained the third prize in the competition for the royal exchange at Dublin: 1775-6 designed the hall of the Freemasons, Great Queen Street (burnt 1833); two sections in CROWLE'S PENNANT, *London*, vii, 36-7; BRITTON and PUGIN, *Public Buildings*, 8vo., 1825, i, 321: *cir.* 1775 designed S. Leonard's hill, Berkshire, for countess dow. Waldegrave, and improved by the duke of Gloucester, NEALE, *Seats*, 4to., London, 1818, i: 1777 appointed architect to the board of works: 1787-90 designed the carved wainscoting around the altar in S. George's chapel, Windsor (see EMLYN): and 1791 was elected an original honorary member of the architects' club. His collection of drawings was sold 1799; a large number are in the British museum, Sir John Soane's museum, and at Windsor castle. A portrait of Sandby after Sir Wm. Beechey has been engraved; another portrait with his wife by Gainsborough, was in the "Old Masters" exhibition of 1877, No. 69: another painted by H. Singleton in second "portrait exhibition" 1867. He died 25 June 1798, aged 76, and was buried at Old Windsor church; a memorial brass was put up Sept. 1833. MULVANY, *Life of Gandon*, 8vo., Dublin, 1846, p. 189, 296. FREEMASON'S MAGAZINE, New Ser., 1860, ii, 5-6. SANDBY, *History of Royal Academy*, 8vo., London, 1862, i, 84; reviewed in *BUILDER Journal*, xx, 633.

PAUL SANDBY, R.A., his brother, born 1732, became head drawing master at Woolwich military academy, resigned 1752, appointed 1768 chief draughtsman there, which position he held until his death 8 November 1809, aged 77, at Paddington. He was the father of water-colour painting. A portrait by Sir W. Beechey was in the second portrait exhibition 1867; and another with an account of him in *PUBLIC CHARACTERS* for 1800, p. 450. MULVANY, 148-9; and SANDBY, i, 102, *ut supra*; GENTLEMAN'S MAGAZINE, lxxix, 1177. To him is attributed (if not by his brother THOMAS) 1794-5 the design for a bridge at Staines, over the river Thames, of three semicircular arches; failing about 1800 it was replaced by a cast-iron bridge of one arch 180 ft. span, by Thomas Wilson (who designed the bridge over the river Wear at Sunderland); it failed in a month, and was replaced by a timber bridge, until 1829-32, when the present bridge of three stone segmental arches was erected by J. and G. RENNIE; *MIRROR Journal*, 8vo., London, 1832, xix, 321. Sale Catalogue of water colour drawings, 1827.

SANDEL BRICK. See SAMEL BRICK.

SANDERS (GEORGE); see SAUNDERS (G.).

SANDERS (JOHN), a pupil of Sir J. Soane. Gained 1788 the gold medal of the royal academy of arts in London; after 1796 restored Holland House, Kensington, for Henry Richard, third lord Holland; designed 19 June 1801-1803 the royal military asylum, King's Road, Chelsea; RICHARDSON, *Vitruvius Britannicus*, fol., London, 1808, ii, pl. 42-3: from 1805 was architect to the barrack department with J. Johnson and H. Hemsley: designed about 1811 royal military college at Bagshot, now Sandhurst College; and retiring from the profession, he travelled, when meeting G. L. Taylor and E. Cresy at Rome, etc., he accompanied them, and 3 June 1818 discovered

the Lion of Chæroneia; *BUILDER Journal*, 1862, xx, 908. The date of his death (after 1821) has not been ascertained.

SANDERS and SAUNDERS BLUE; improperly written for CENDRES BLEUES.

SANDERSON (JOHN), with Smith, designed Kirtlington or Kirklington park, Oxfordshire, for Sir James Dashwood; and in his own name Stratton park, Hampshire, for the duke of Bedford; the marquis of Tavistock pulled down a large portion of it for fear it should be preferred to Woburn; and later it was sold. WOOLFE and GANDON, *Vitruvius Britannicus*, fol., London, 1767, i, pl. 36-9; 55-6. He also designed Steephill cottage, Isle of Wight, for Hans Stanley, earl of Dysart. He died 1834 in Cork Street, London.

SAND FOUNDATION. The sand is recommended to be moderately fine, of equal grain, and not earthy; and to be rammed in layers of about 8 ins. thick. It is supposed that the pressure is equally distributed on the sides as well as on the base. *Notes on the Employment of Sand for foundations in marshy or soft soil*, CORPS OF ROYAL ENGINEERS, *Papers*, 4to., iv, 210.

The foundation of the northern brick pyramid at Dashoor was obtained by levelling the stony surface of the desert by a layer of fine sand confined in its place on all sides by a stone platform 14 ft. 6 in. wide and 2 ft. 9 in. thick, which supported the stone external casing. The pyramid was built upon the sand. Sand has also been used at Campbell's tomb at Gizeh; the temple near the pyramid of Reegah; the platform of the northern pyramid at Abouseir; and some smaller tombs; as stated in VYSE, *Pyramid, etc.*, 1842, iii, 61. The system of using sand for foundations in modern times appears to have been first adopted in France in 1822, by Devilliers, C.E., when employed on the canal of S. Martin, but of which there is no account. In 1830 capt. Gauzeance, an engineer of France, used it for the support (in lieu of concrete) of the portico of the guardhouse of Mousserolles at Bayonne, as described in *CIVIL ENGINEER, ETC., Journal*, 1844, vii, 119. It was also used in some of the fortifications at Bayonne; 1836 a quay wall of a harbour on the coast of Brittany, and other places named therein. *Building on loose sand*, *BUILDING NEWS Journal*, 1876, xxx, 114. READE and GOODISON, *On the Construction of Sowers in Running Sand*, at British Association, 1870, *BUILDING NEWS Journal*, xix, 256.

The ingenious invention for constructing lighthouses on sandbanks has been carried out at Fleetwood, and the Maplin sands in the Thames, and at the point of Air at the mouth of the river Dee, in Flintshire,—the former by screw piles, the latter by cylinders; *CIVIL ENGINEER, ETC., Journal*, 1844, vii, 293. Experiments to test the bearing power of sand for piles sunk 16 ft. to 23 ft. in it, for the iron viaducts across the rivers Leven and Kent, in Morecambe Bay, by James Brunlees, C.E.; *INSTITUTION OF CIVIL ENGINEERS, Proceedings*, 1858, xvii, 442-3. LIGHTHOUSE. CYLINDER.

It is found that sand produces the most efficient tamping in connection with blasting.

SANDHOLE in casting. An accidental deposit of sand in a metal casting, from one or more of the following causes; viz., by loose sand falling from some part of the mould, or washed in from the runner at the time of casting, or from bad skimming at that time, or from air confined in the mould owing to its insufficient ventilation. The occurrence of such defects in cast-iron girders and columns, seriously diminish the strength of the castings. When skilfully concealed by dishonest foundlers so as to escape detection by the architect or his inspector, they are likely to lead to, and have caused, serious accidents. STOPPING.

SANDHOLE in stone; also called a sand vent. A deposit of sand in a block of stone; generally, it is the same sort of sand of which the stone is composed, but deficient in the cementitious matter to combine it into stone. In limestones and oolites, the sandholes are often lined with crystals of lime of stalactite character, arising from the evaporation of the water which had collected in the spot and caused the formation of the cavity.

SANDING. A process frequently adopted in outside work, by fine sand being thrown on the last coat of paint while wet. **ROUGH CAST.** CASTING.

SAND PAPER. Coarse paper prepared with strong glue over which fine sand is equally distributed. **GLASS PAPER** and **EMERY CLOTH** are similar materials. **URE**, *Dict.*, 4th edit., 643. **BUILDER Journal**, xv, 380.

SANDRIÉ (..... feu), designed 1819-20 the synagogue in the rue N. D. de Nazareth, at Paris; **GOURLIER**, and others, *Edifices Publics*, fol., Paris, 1825-36, i, pl. 195.

SANDS (.....) designed 1814-5 the new bridge at Dorchester, Oxfordshire, of Headington stone; it is a quarter of a mile long and 30 ft. wide, with one arch over the river; plate in **GENTLEMAN'S MAGAZINE**, 1816, ii, 297.

SANDSTONE (Fr. *grès* or *grais*; Scot. *freestone*, but a misnomer; Ger. *sandstein*). Rocks chiefly consisting of siliceous particles that have been deposited in layers by water, and have become consolidated by pressure, heat or some other force, into rocks of greater or less density. All sandstones, or grits, do not possess the same durable qualities; some of them moulder and decay by exposure to the weather. Those containing deep red streaks are not to be depended upon, as these marks are proofs of the presence of oxide of iron, which soon crumbles out.

"Sandstones that are usually employed for building purposes, and which are generally composed of either quartz or siliceous grains cemented by siliceous, argillaceous, calcareous, or other matter, their decomposition is effected according to the nature of the cementing substance, the grains being comparatively indestructible.—Sandstones, from the mode of their formations, are very frequently laminated, more especially when micaceous, the plates of mica being generally deposited in planes parallel to their beds. Hence if such a stone be placed in buildings with the planes of lamination in a vertical position, it will decompose in flakes, according to the thickness of the laminae; whereas if it be placed so that the planes of lamination be horizontal, that is, most commonly on its natural bed, the amount of decomposition will be comparatively immaterial. Sandstone has been used at Ecclestone abbey, xiii cent., now in excellent condition; the round keep of Barnard castle; Tintern abbey, parts; Whitby abbey, parts; older portions of Ripon cathedral, and Rivaux abbey, fair; Norman keep of Richmond castle, Yorkshire; Hardwicke hall; and Haddon hall, are all in a good state, as are all the buildings of Craigleith stone at and near Edinburgh: while at Durham cathedral, the churches at Newcastle-on-Tyne, Carlisle cathedral, Kirkstall abbey, and Fountains abbey, are in advanced state of decay; as are the sandstone churches of Derby, and the church of S. Peter at Shaftesbury. Tisbury church, constructed of a calciferous variety of sandstone, is in unequal condition." Commissioners' *Report on Stone* for the Houses of Parliament, 1834, 2nd edit., 1845. *Memoirs of the Geological Survey*; *Mining Records*, *Mineral Statistics*, by HUNT, being part 2 for 1858, 8vo., London, 1860. **HULL**, *Building and Ornamental Stones*, 8vo., London, 1872. **BUILDING NEWS Journal**, 1878, xxiv, 387. **WILKINSON**, *Geology, etc., of Ireland*, 8vo., 1845, p. 34. *Scottish Building stones*, **BUILDER Journal**, April 1876, p. 311.

Sandstones absorb the least water, but they disintegrate more than the magnesian limestones. The heaviest and most cohesive of the sandstones are the Craigleith and the Park Spring. The Sussex sandstones are very porous; **BUILDER Journal**, 1854, xii, 190. Many sandstones are first-class **FIRE-STONES**. **DENISON**, *Church Building*, 8vo., 1856, p. 193, records the effects of fire on sand and lime-stones. *Strength of Sandstones*, **BUILDER Journal**, viii, 434. **CLARK**, *Brit. and Conway Tubular bridges*, 1850. *Relative cost of masonry*, **CIVIL ENGINEER**, etc., *Journal*, 1844, vii, 298. *London Masonry*, **BUILDING NEWS Journal**, July 24, 1874. **RED SANDSTONE FORMATION.**

Sandstone was preferred for the walls and columns (of several pieces) of the temples in Upper Egypt; the use of granite being confined to statues, obelisks, doorways, and adyta,

while in the Delta the temples were built chiefly of granite with monolithic pillars. Exposure to the external atmosphere, which here generally affects calcareous substances, was found not to be injurious to the sandstone of **SILSILEH**; and, like its neighbour the granite, it was only inferior to limestone in one respect, viz., that the latter might be buried without risk of its being corroded by the salts of the earth; **WILKINSON**, *Ancient Egyptians*, 8vo., London, 1837-46, p. 50, 412; *Handbook to Egypt*, 1880, p. 504, 508, 512, 533-4. **EGYPTIAN ARCHITECTURE**, 22b. **ATMOSPHERIC INFLUENCE.**

White sandstone of Cheshire, **BUILDER Journal**, viii, 761. *Grey*, of Dean Forest, *idem*, xviii, 431. *Red*, of Cheshire, *idem*, xviii, 761; also from Grinshill near Shrewsbury, Mansfield in Nottinghamshire, Shawk, Cumberland, and Newbiggin, Westmoreland. *Yellow*, of Cheshire, *idem*, xviii, 761; **ANDERSON**, *Dura Den, a monograph of the yellow sandstone, etc.*, 8vo., 1859. The sandstone belonging to the Cefn range, at Plaspower, Nant, near Wrexham, much used at Liverpool, Manchester, etc.

American sandstone; Nova Scotia; New Jersey; Connecticut brown sandstone; **BUILDING NEWS Journal**, 1856, ii, 467. **CIVIL ENGINEER**, etc., *Journal*, 1848, xi, 378. Red of India, see **DELHI**, and **LAHORE**. Of France, **BRARD**, *Minéralogie*, 8vo., 1821, ii, 37; and **QUAT. DE QUINCY**, *Dict. d'Arch.* Of Germany, **BUILDER Journal**, xv, 240.

SANDWICH BEAM. A name sometimes given to the flitch GIRDER, and the LAMINATED RIB.

SANDYS (FREDERICK), of Bury S. Edmunds, designed Ickworth House, Suffolk, for Fred. Aug. Hervey, Esq., to whom the design is attributed, as also to M. Asprucci of Rome. It was commenced 1792, the roof of centre portion put on in 1803, so left for twenty years, when the wings were added; it was first inhabited 1830. A plan, view, and description are given in **GAGE**, *Suffolk, Thingoe Hundred*, 4to., London, 1838, p. 304-9. He exhibited at the Royal Academy, 1800 Worlingham hall, and Great Tinborough hall; 1802 entrance to Chippenham park, Cambridgeshire, seat of J. Tharp, Esq.; 1806 New Assembly rooms, Bury S. Edmunds; and 1809 Westdean house, Sussex, for lord Selsey. The date of his death has not been ascertained.

SANDYX. A colour used by the ancients; see **SANDARACHA**.

SANFELICE (FERDINANDO), cavalier, also a painter, born 1675 at Montagna, practised at Naples, where are the following works by him:—cir. 1700 palazzo Majo with its geometrical staircase: palazzo Serra Cassano with the most noble and commodious staircase in the city: at the church of S. Giovanni à Carbonara, the steps in front, the sepulchre of Gaetano Argento, the staircase in the monastery, and its library in the form of a star over a bastion: cir. 1728 restored the palazzo Salviano; designed the capella Pignatelli in SS. Apostoli; the palazzo Spagnuolo with its double geometrical staircase; the Sta. Maria al Borgo della Vergine; the church de' Gesuiti: new roofed the monastery of Sta. Maria Regina Cœli, modernized the façade, and rebuilt the lower half of the campanile: improved the dome of the church of the monastery of Donna Alvina: designed for himself the palazzo San Felice (with a double staircase); enlarged the palazzo Monteleone, the great gate of which is curiously carved: three palazzi for his family, one in the Borgo delle Vergini, another outside the gate of Constantinople, and the third near the seggio di Montagna: the high altar in the church (designed 1709 by F. Picchiatti) called Il divino Amore: façade of the church of S. Lorenzo; and numerous other buildings in the city and in the provinces; as at Pizzofalcone, the palazzo Serra, the staircase in which is considered the most magnificent in the city; and the church La Nunziatella. Designed the decorations for the obsequies of king Charles II of Spain; those on the arrival of Philip V; and for the nuptials of king Charles of Bourbon. The date of his death is not ascertained.

SAN FELICE (PIETRO), born 1620, son of Maso Felice of Rome, pupil of Bernini, practised at Rome, Bologna, Ferrara,

Perugia, and died 1675 at Piacenza, aged 55. PASCOLI, *Vite-Perugini*, 4to., Rome, 1732, p. 210.

SAN GALLO (GIOVANNI FRANCESCO DA), a nephew of Antonio GIAMBERTI called San Gallo, worked at St. Peter's at Rome under the proveditor Giul. Leno; and executed part of the design made 1520 by Raffaello da Sanzio for the palazzo Pandolfini, now Nencini (iii, 46), for the bishop of Troja on the via di S. Gallo at Florence (GAYE, ii, 160-9; 178; 180-8; FAMIN ET GRANDJEAN, *Arch. Toscane*, fol., Paris, 1837; details in RUGGIERI, *Studio d'Arch. Civile*, fol., Flor., 1755, ii, 73-5; FANTOZZI, *Guida*, 1842, p. 445). He was at Pisa, Pistoia, S. Geminiano, Florence, 1528 Borgo S. Sepolchro, 1529 Arezzo, and dying in 1530, the palazzo was probably completed about 1538 by his brother Bastiano.

SAN GALLO (BASTIANO or SEBASTIANO DA), born 1481, called "Aristotile", also a painter, is called by VASARI a nephew of Guil. and Ant. GIAMBERTI, and cousin of Ant. PICCONE (NAGLER, *Diz.*, says son). He was a pupil of Pietro Perugini, and companion of Ridolfo Ghirlandajo; measured the plans of buildings at Florence; 1534 visited his brother at Rome; bought land behind the convent of the Servites at Florence on which he built himself a house; 1515 erected with F. Granacci, opposite the gate of the abbazia, an arch of triumph on the pope's visit to Florence; and assisted in the preparations for the marriage, as well as many scenic representations, for the courts of the Medici. He then went to Rome, to his cousin Antonio Piccone, who engaged him to superintend certain buildings there and also the erection of a large part of the walls at Castro; at Rome he among other artists assisted Michael Angelo at the Sistine Chapel (VASARI, v, 255); became engaged on theatrical representations; and 1547 returned to Florence, where he was employed by duke Cosimo on his buildings until his death 31 May 1551, aged 70; he was buried in the church of the Servites. VASARI, *Vite*, Flor. edit., x, 28; 70. 73.

SANGARIUS LAPIS. An ancient marble so called from a river in Phrygia; corallitic; a dead ivory white; the pieces worked did not exceed two cubits (about 3 ft.).

SAN GERARD MARBLE. A Flenish marble, varying according to the quarry.

SANGIORGIO. A village between Argos and Corinth, near which are the ruins of the temple to Jupiter Nemæus, given by the SOCIETY OF DILETTANTI, *Antiq. of Ionia*, fol., London, 1821, ii, 21.

SAN GIOVANNI. A town in Tuscany in Italy, situated on the river Arno. It has a so-called cathedral. In LECLERE, *Recueil*, fol., Paris, 1826, pl. 96, is a measured plan by his pupil Grasset of the "Place publique de S. Giovanni", showing the gate in the wall, hotel de ville in the place, and the church beyond, arranged symmetrically. 28. 50.

SANGIOVANNI (S. DI) and S. Sangiovanni, errors in NAGLER, and in DOMINICI, ii, 169, for GIOVANNI (S. DE).

SAN GIOVANNI ORTEGA; see ORTEGA (S. JUAN DE).

SAN GONSALVO and San Pietro Gonsalvo; see GONSALVO (SAN).

SANGRO (RAIMONDO), designed Sta. Maria della Pietà de Sangri, inside (?) S. Severo at Naples.

SANGUINO ANTICO; VERDE. An ancient green marble, a breccia.

SANI (DON DOMINGO MARIA), 1734 was employed on the royal works at Madrid and elsewhere. 66.

SANING (DOMINICUS ANTONIUS DE) architectus, occurs among the old Italian drawings at Windsor castle.

SANTARY PAINT. Materials used in the painting and decorating trades prepared from innocuous ingredients, to supersede the old white lead and many other injurious pigments. A "petrifying liquid" for damp walls; a "silicate distemper", and others are supplied by the Sanitary paint company of Liverpool and London, 1881. *BUILDER Journal*, 1855, xiii, 491.

SANITATION. The principle of health preserving; comprising the essential consideration, arrangements, and appliances

ARCH. PUB. SOC.

for adoption of the following subjects among others:—air, site, soil; Construction, as concrete, damp course, gutter and eave, hollow wall, basement, ventilating shaft: External sewerage, as pipe drain, cesspool, trap, flush tank: Internal sewerage, as drain, water closet, earth closet, sink trap, grease trap, housemaids' closet and sink, bath, lavatory, urinal, dust shoot: Ventilation; Water, filtration and distribution. Many of these are considered in this work with references to publications.

PUBLIC HEALTH. MICHAEL, *The Sanitary Act*, 1866, 29 and 30 Vict., c. 90; and *Sewage Utilization Act*, 1865, 8vo. LUMLEY, *Act of 1875*, 8vo., 1876. GLEN, *Act of 1875*, 8vo., 1878. W. R. SMITH and H. SMITH, *The Laws Concerning Public Health, including the Sanitary Acts passed in the Session 1883*, etc.

PARKES, *Manual of Practical Hygiene*, 5th edit., by F. de Chaumont, 8vo., 1878. ROBINS, *Sanitary Science in its relation to Civil Architecture*, read at Royal Inst. of Brit. Archts., 29 Nov. 1880.

CHADWICK, *Report of 1842*, still useful. GAVIN, *Sanitary Ramblings, Bethnal Green, etc.*, 8vo., 1848. REMONT, *Sanitary Regulations of London, adapted for Liège*, 8vo., Liège, 1850. *Sanitary Legislation Laws*, *BUILDING NEWS Journal*, 1858, iv, 1194. *Sanitary progress generally*, *BUILDER Journal*, 1860, xviii, 244. WARE, *Handy book of Sanitary Law*, 8vo., 1866. SLAGG, *Sanitary work in villages and small towns*, 8vo., 1876. PARKES, *Sanitary appliances; public health*, 8vo., 1876. MARSH, *Handbook of Rural Sanitary Science*, 8vo., 1876. *Rural Sanitation*, *BUILDER Journal*, 1877, xxxv, 1015. DENTON, *Sanitary Engineering, Lectures, etc.*, 8vo., 1877. METCALFE, *Sanitas Sanitatum et omnia Sanitas*, 8vo., 1877. TEALE, *Dangers to Health*, 1880. *London Sanitary Protection Association*, 1881, etc. DENTON, *Handbook of House Sanitation for all persons seeking a healthy home*, 1882. *The Sanitary Record*, commenced 1878, is the organ of THE NATIONAL HEALTH SOCIETY. SANITARY INSTITUTE OF GREAT BRITAIN, *Transactions*, 1883. PARKES MUSEUM OF HYGIENE.

COLLINS, *Sanitation as an Increment of value in House property*, read at Institution of Surveyors, 1881. *STANDARD Newspaper* 21 July 1880 on late Mr. Serjeant Parry's house in Holland Park.

SAN JUAN DE ORTEGA; see ORTEGA (S. JUAN).

SAN LORENZO; see GONSALVO (SAN).

SAN LUCANO (N. DA); see NOVELLA (A.).

SANMICHELE (PAOLO), carried up after the design of his cousin Michele SANMICHELE, to a certain height the façade of the church of Sta. Maria in Organo, at Verona.

SANMICHELE (GIOVANNI GIROLAMO), son of Paolo, was a nephew and pupil of Michele, and was greatly employed by the Venetians to set in order the fortresses, and to execute his kinsman's designs; as at Zara in Dalmatia, the strong fortress of San Niccolò in Sebenico which he raised from the foundations; and restored the great fortress at Corfu, rebuilding the two great towers on the land side. He inspected all the fortresses in Cyprus, and reported in writings and drawings, but being taken ill he gave them to his brother-in-law Luigi Brugnoli to take to Venice. He died 1559, aged 45, and was buried in San Niccolò at Famagousta. 39. 73.

SANMICHELE (GIOVANNI), father of MICHELE, had two other sons. BARTOLOMMEO SANMICHELE, uncle of Michele, was also of great merit. 73.

SANMICHELE (MATTEO), a kinsman of Michele, designed and constructed the city and fortress of Casale di Monserrato for the marquis Guglielmo VIII, 1470; again added to in 1560 and 1590. He is also said by VASARI to be the author of the fine sepulchre of Maria daughter of Stephen, king of Servia, and marchioness of Montserrat, in the church of S. Francesco, in the town. 73.

SANMICHELE (MICHELE); Sammichele; Michele de Gio. Michele detto Sammichele, by DELLA VALLE (*Orieto*, 380); Michel San Miehiele; and Michele Micheli, by MAFFEI, born in

1484 at Verona, studied under his father Giovanni and his uncle Bartolommeo (the family *casa* is given pl. 1). At 16 years of age he was sent to Rome and studied the antiquities. [As only a few dates are found, the order of his works as arranged by VASARI will be followed nearly.] Being invited to *Orvieto* he was 1521 appointed superintendent of the works at the duomo, wherein he executed two altars. He also designed several palaces at Orvieto; and *cir.* 1510 the sepulchral chapel for one of the Petrucci family in the church of San Domenico (98); several houses at Monte Fiascone, where the cathedral is attributed to him (94) but is by A. (PICCONI) da Sangallo. Pope Clement VII (1523-24) sent him with Piccone to inspect the fortifications in the papal states, especially Parma and Piacenza, the works at the latter place being carried out by G. Leno. After some years he revisited *Verona*; studied the fortifications at Treviso, was arrested at Padua as a Roman spy by the Venetians, into whose service he entered soon after, and for whom he 1527 carried out at *Verona* his design for the first time of *angular* (in place of circular) bastions, called the *Maldalena* (130); then designed the castle at Legnago (149) and the porta S. Martino called porta Stuppa (143), the castle (146) and porta (147) of Orzi Nuovo almost from the foundations (demolished *cir.* 1810); made designs at Milan and elsewhere for Francesco Sforza, last duke of Milan; and visited Casale di Monserato to inspect the city and its fortifications carried out by his cousin MATTEO. He then returned to *Venice*, and accompanied the duke of Urbino to inspect the fortifications in the Venetian states for restoring and improving them, as at Chiusa, in Friuli, at Bergamo, Vicenza, Peschiera, Brescia, La Chiussa, two fine gates at Legnago; 1534 the two bastions of Santa Croce (145) and Cornaro at *Padua*, and other places. He was also sent on the same errand into Dalmatia, where 1543 at Zara he designed the porta di Terrafirma (134); a large cistern (139); and a brolletto or loggia in the piazza de' Signori, carried out by his nephew Giov. Girolamo, who after having fortified that city (built by Charles V, 1519-58), erected 1546 from the foundations the strong fortress of S. Niccolo (137) at the mouth of the port of Sebenico, called his masterpiece; and the beautiful loggia on the quay at Lesina in Dalmatia for the meetings of the municipal councils. In great haste he then visited and restored the fortifications at many places in Corfu, and in all the strong towns of Cyprus and Candia (150), with Canea from the foundations; Retimo, Settia, and Napoli di Romania, which latter resisted the Ottoman invasion.

Returning to *Venice* he was employed to construct the fortress on the Lido, Sant' Andrea del Lido (113), at the entrance to the harbour, a stupendous work executed with great difficulty on piled foundations. He restored and fortified Marano (not Murano) near the city, where he designed the nunnery of S. Biagio Catoldo at the guidecca; the palazzo Cornaro now Mocenigo near San Polo (32) and the "pavillon des nymphes" (43), restored the palazzo Cornaro now Spinelli near San Benedetto all' Albore; 1595 the palazzo Grimani (10 and 63) for Girolamo Grimani near San Luca, finished by others who altered the upper portions; restored the palazzo Bragadini a S. Marina; palazzo Cussoni al ponte di Noale on the grand canal; and the porta del Bucintoro all' Arsenale (62). Near Castel-Franco, the renowned palazzo La Soranzo (46) now demolished; the casa Cornaro near Piombino; at *Padua*, the sepulchral chapel to cardinal Pietro Bembo (89), and the chapel-like tomb to Alessandro Contarini (88), both in the church of S. Antonio; (the latter attributed 1706 to A. Zeno by some writers); and the palazzo Roncali or governor's palace at Rovigo (53).

At *Verona*, he 1533 designed the porta Nuova (106) (the roof is modern); porta del Palio, with a loggia on the inside, left unfinished at his death (122); the porta S. Zenone (117); the fortifications (128); the bastions Boccare (129), S. Bernardino (131), S. Zenone (132), and Della Spagna (133); *cir.* 1550 the circular Guarnaschi (now de' Pellegrini) chapel in the church of

S. Bernardino (100), continued by others 1557, and completed 1793 for the marshal Carlo Pelegrini by conte B. GIULIARI and F. ALBERTOLI, who published *Capella, etc.*, fol., Verona, 1816, 30 pl.; it is built of the local stone called *brouzo*; commenced 1559 the circular church of the Madonna della Campagna (64), near the city, completed after his death by B. Brugnoli; the façade of S. Maria in Organo for the monks of Oliveto in the city (80), commenced by his cousin PAOLO and yet incomplete; he strengthened the side of the monastery of San Giorgio and added the cupola, which was continued with the campanile by B. Brugnoli; the *lazaretto* near the river (58) the design for which was cut down; designed the presbytery (70), and the upper portion of the campanile (73) of the cathedral, but the work being eventually entrusted to "a man of poor acquirements" it failed, on which Michele reconstructed his model and the design was carried out by B. Brugnoli; an octagonal chapel (92) for the conte della Torre at Fumane (not the altar) near Verona; with the tomb of the family in the church of S. Francesco at Verona; the church (?) of S. Tommaso of the Carmelites; 1593 the palazzo Canossa for conte Ludovico Canossa, monsig. di Bajoux (Bayeux), altered and the balustrade added by another hand (16); another large palace for him at the villa of Grezzano; the palazzo delle Torre (48); restored the façade and interior of the castello di Bevilacqua, the cornice is by another hand (4); the palazzo Gran Guardia or Guastaverza (27) nella piazza di Brà, partly finished or after his school; the door to and perhaps the casa Pellegrini; the palazzo Verzi; the palazzo Larezola (22) now Pompei (1832-8); the porta of the courts of justice; that of the podestà or chief magistrate (61), on the piazza de' Signori; del Capitano (40); della Trinità (26); des Notai (37); Saibante (38); Uberti (41); and Verità (42); sepulchral monument to Tommaso Lavagnoli in S. Euphemia (91); and that to Tommaso da Vico in S. Zenone (90); with the dome (82) and the campanile (76) to the church of S. Giorgio en Braida.

Giov. G. Sanmichele and A. Midano were his pupils. A beautifully worked crucifix in the cathedral of S. Michael at Verona is attributed to Michele, as also the painting in the dome of the church of S. Bernardino (26). He died (day unknown) in 1559, aged 75, and was buried in the church of S. Tommaso (the upper part of which he is said to have designed), among the tombs of his forefathers. A monument to his memory by N. Sanmichele was erected soon after.

The old type figures denote the number of the plate given in RONZANI and LUCIOLI, *San M.; Fabbriche civili, etc.*, fol., Venice, 1831; by Dianoux, fol., Milan, 1875-8; and Genoa, by Zanotto. POMPEI, *Le cinque Ordini dell' Archit. Civile di S. M., rilevati dalle sue fabbriche*, fol., Ver., 1735. ALBERTOLI, *Porte di Città e fortezze depositi sepolcrali ed altre principali Fabbriche, etc.*, 29 pl., at Verona, fol., Milan, 1815. CIOGNARA, DIEDO AND SELVA, *Fabbriche—di Venezia*, 2 vols., fol., Ven., 1838-40. MAFFEI, *Verona Illustrata*, 4to., Ver., 1771, ii, 70, 72, 88, 98-9, iii, 67, 150-1, 169-171, 217, 330. STRANGFORD, *Eastern Shores of the Adriatic in 1863*, 8vo., London, 1864, p. 217; 263-5. R. H. R., *Rambles in Istria, etc.*, 1875, p. 81. SELVATICO, *Architettura in Venezia*, 8vo., Venice, 1847, p. 266-78. WOODS, *Letters*, 4to., London, 1828, i, 236. A. SILVA, *Discourse*, 1814. TEMANZA, *Vite, etc.* ZENDRINI, *Memorie Storiche*, 4to., Padua, 1811, i, 291, gives a report by Sanmichele on the porto di Malamocco, *Verona, Notizie, etc.*, 8vo., Ver., 1795, pp. 38, 48, 62, 96, 98, 106, 119, 131-2, 136. QUATREMERRE DE QUINCY, *Vies*, 8vo., Paris, 1830, i, 155-78. GINORI, *Serie uomini, etc.*, 4to., 1772, v, 29, gives a portrait.

1. 3. 14. 25. 28.

SAN MINIATO de' Tedeschi (MONTE). A town near Empoli in Tuscany in northern Italy, near the confluence of the rivers Elsa and Evola with the Arno. It was fortified by M. A. Buonarroiti, and has a lofty mediæval tower on the top of the hill. It is the see of a bishop.

The cathedral dedicated to Sta. Maria and S. Genesio is of x cent., reduced 1488 and adorned 1755. The church outside the

gates dedicated to S. Salvatore del Monte, or S. Francesco del' Osservanza, 1211, 1276, 1343, was nearly rebuilt 1480-88 by S. Pollajuolo; Buonarroti called it "la sua bella villanella"; in 1775 statues and stuccoes were added; S. Giacomo e Lucia, and that of S. Stefano date from XII cent.; Sta. Caterina XIV cent.; and dell' Annunziata. There is also a large hospital and episcopal palace. 28. 50. 96.

SANNAT (FRANÇOIS) succeeded January 1560 to Jean Bultant as contrôleur des bâtimens de la Couronne. BERTY, *Les Grands Architectes Franç.*, etc., 8vo., Paris, 1860, p. 153.

SAN NICOLAS (L. DE); see LORENZO (L. and P. DE).

SANO, son of N. di Cecco del Mercia, together completed about 1340 the six-storied parti-coloured campanile to the duomo at Prato, begun 1317 by G. Pisano. *Detached Essay*, Campanile, p. 4; view in FERGUSSON, *Illustr. Handbook*, 1855, p. 786; from WIEBEKING, *Monumens*, fol., Munich, 1839-40.

SAN PIETRO IN GRADO. A town near Pisa in Central Italy, having a church built with ancient Greek marbles and erected before 1000; the early Lombard style differs from the duomo at Pisa; the painted decoration is archaic, and it has three apses. The massive brick tower dates *cir.* 1100-1200. The church was altered 1790. 28.

SANPOLO (NICCOLA), of Reggio, also sculptor and intarsiator, pupil of Prospero Clementi, was living 1625. 93.

SAN QUIRICO. A town near Siena in Central Italy. The collegiate church existed in 1029, Lombard Gothic; its three portals, one being dated 1288, are exceedingly curious; the west porch has double colonnettes linked together in the middle, and the side door has figures, which are great rarities in Italy and not earlier than XIII cent.; GALLY KNIGHT, *Eccles. Arch.*, fol., London, 1842-4, ii. A square tower supposed to be of Roman origin, and the vast palazzo Piccolomini, are of interest. 28.

SAN REMY BLUE. A marble of Belgium, occasionally imported into England for chimney-pieces. Possibly "bleu Belge".

SAN ROMAN DE HORNIA. A town in Leon in Spain. The church of the priory of Sta. Maria de Duero was designed *cir.* 1731 by Francisco Ascondo called fra Juan. The SPANISH GOVERNMENT publication gives a plate "Restos del antiguo Monas Visigodo".

SAN or SAO SALVADOR with the port DE BAHIA de Todos os Santos. A city and seaport of Brazil, founded 1510, and the capital until 1763 removed to Rio Janeiro. The rua da Praya, in the lower town, runs about four miles along the shore, and contains the commercial buildings, the large church of the Conceição built of stones sent out and marked from Lisbon; BUILDER *Journal*, ix, 263: the exchange, warehouses, arsenal, etc. In the upper part of the town, built on the crest of a hill, are the public buildings all of stone, the governor's residence 600 ft. square; the archiepiscopal palace near the cathedral; medical and military school in the former Jesuit college; theatre; water-works, before 1857 also supplying the fountains purchased at the Paris exhibition; and gas works, BUILDER *Journal*, 1860, xviii, 435. Besides ten parish churches, that of the cathedral, formerly the Jesuit church of São Salvador, is the most important; there are numerous others nearly all of a sumptuous character, some with monasteries and convents, that of Nossa Senhora da Piedade is a large Spanish edifice; SARTORIUS, *Voy. Pitt. dans le Brésil*, 1855. The finely wooded promenade has a marble monument to commemorate the landing (1808) of don John VI, the first royal governor of Brazil. On Victoria hill are situated the finest houses and gardens, the residences of the British merchants; and the English cemetery; an English protestant chapel is in another suburb. *Diccionario Geo. Imp. Brazil*. KIDDER, *Brasil*, 8vo., Phil., 1857. GARDNER, *Travels in Brazil*. BUILDER *Journal*, 1857, xv, 712. RIPLEY AND DANA, *Amer. Cycl.*, 1874, s.v. Bahia. 50.

SAN SEBASTIAN. A city and seaport, the capital of the province of Guipuzcoa, in Spain, situated on the river Urumea, crossed by a bridge. The castello de la Mota on the summit of Monte Argullo was planned 1694 by H. Torels or Torelli.

Nearly all the buildings were burnt in the siege of 1813, and the ramparts are now destroyed. The modern houses are arranged in spacious streets and squares, *cir.* 1821 by S. Perez. The parish church of Sta. Maria begun 1743 by don P. I. de Lizardi and M. de Salezan; and finished 1764 by F. Ibero; the pulpit of black stone, etc., 1610, is by P. de Zaldúa. San Vicente 1507, is by M. de Santa Celay and J. de Urrutia. The Dominican monastery of S. Telmo with its church, commenced 1551 by M. de Santiago, was completed by M. de Burbacoa with M. Sagarclo; the large chapels, the staircase of the monastery with other portions 1551 are by J. Santisteban. The arsenal in a suppressed monastery; good courthouse (Doric), theatre, aqueduct 1566 by J. Sanz de Lapáza, and cisterns, etc., after 1700 by D. L. Arias. A view of the city and of the interior of the cathedral are given in TAYLOR, *Voy. en Espagne*, 4to., Paris, 1832. 28. 50. 66.

SANSEVERINO; see SEVERINO (SAN), in Central Italy.

SANSIMONE is stated by LETAROUILLY, *Rome Moderne*, p. 554, pl. 267, to have added the attic story to the palazzo Stoppani at Rome designed by R. Sanzio, giving a bad result.

SANSOVINO or SANSAVINO; see CONTUCCI (ANDREA).

SANSOVINO; see TATTI (JACOPO and ANTONIO).

SANTA BARBARA (FRAY FRANCISCO DE), born 4 March 1731 at Olalla in Aragon; studied theology in the monastery of the calced Carmelites in S. Felipe ó Játiva, in Valencia, where resided his uncle fra Josef Alberto Pina, who had designed this college, with whom he studied and professed in the monastery of S. Miguel de los Reyes, 29 May 1757. As director of the works he 1763 designed the new cloister of that monastery; the capilla del Sagrario in the parish church of Rubielos de Mora; the aqueduct in the pastures of Campello near Segovia; the church in the district of Burjasot near Valencia, with that of S. Antonio in the calle de Murviedro in that city; the parish church of Cheste; directed the irrigation in the township of Benimamet; and designed other works for the college of his order, as also at Avila, but was obliged to remain at the Escorial with a fever; he there translated from the French some works on architecture, geometry, etc., and compiled others, together with a plan of the monastery of Huerta, all still preserved. He died 5 January 1802 in the monastery of S. Michael de los Reyes. 66.

SANTA CELAY (MIGUEL DE), with J. de Urrutia, of Guipuzcoa in Spain, designed 1507 the parish church of S. Vicente in S. Sebastian. 66.

SANTA CROCE (GIROLAMO), born 1502, designed *cir.* 1530 the chapel of the marquis de Vico in the church of S. Giovanni a Carbonara, at Naples, but this is given to P. de Prado of Zaragoza by LLAGUNO. He died 1532 according to DOMINICI, who gives a long list of his works in sculpture. 36.

SANTA CRUZ DE LA SIERRA; see CRUZ (SANTA) in Bolivia.

SANTA CRUZ DE TENERIFFE; see CRUZ (SANTA).

SANTA FE DE ANTIOQUIA; see FE (SANTA), in New Granada.

SANTA FE DE BOGOTA; see FE (SANTA), in New Granada. SANTALUM; see SANDAL WOOD.

SANTA MARIA DE ALBARRACIN; see ALBARRACIN.

SANTA MARIA TIMBER. A timber of South America, where it is extensively used for shipbuilding; Prof. Grace Calvert reported in 1861 upon it as being sound and resinous, and but little inferior to teak; BUILDER *Journal*, 1861, xix, 851.

SANTE; see LOMBARDO (SANTE).

SANTEN (JAN VAN), Sante and Santhen; called in Italy, Giovanni Vasanio, Vansantio, Vansanzio, Van Zanzio, and Vesanio, also Giovanni Fiamingo, Flamingo, or Flaminio. He was born at Utrecht, went to Rome, where he worked at first in ebony and ivory; studied the antiquities, and also under Flaminio PONZIO, who dying before 1621, his works were completed by Santen; he also succeeded him as architect to pope Paul V, and Gregory XV (1621-3). For pope Paul V (1605-21) he en-

larged the palazzo Mondragone at FRASCATI, the entrance is by Ponzio; added the portico with double columns to the church of S. Sebastiano commenced by Ponzio; designed the palazzo or casino outside the porta Pinciana, or porta del Popolo, for cardinal Scipio Borghese on a good plan but the façades (front 165 ft. long) overloaded with bas-reliefs, etc., after his former trade; FERRERIO, *Palazzi*, fol., Rome (1655), ii, pl. 26-7; *Giardini*, fol., 1695, pl. 6, or 15 and 16; it was enlarged during XVIII cent., and converted into sculpture galleries by L. Canina, who decorated the interior: the gardens of the large palazzo at Monte Cavallo or Monte Quirinus for cardinal Borghese, later pal. Altamps, Bentivoglio, Mazarin and now Rospigliosi; LET., 672, pl. 328; the fontane di Narcisso, a rustic and two circular basins, in FALDA, *Fontana*, fol., Rome, 1675, iii, pl. 11-3 (or 63-5). He restored the fountains in the interior courts of, and designed the loggia in front of, the casino of the villa Pia, in the Vatican garden; the ornament to the tower entrance to the Vatican on the design 1608 of C. Maderno (not by Ferrabosco, though he and van Santen made designs for it) destroyed 1660 by Bernini for his porticoes; BONANNI, 212-3, 225, pl. 81: the door of the pontifical palace where the Swiss guard attend; and other embellishments in the city, including 1623 a tomb to his friend W. van Wede, painter. He died 1623 at Rome. The front part of the church of S. Peter at Gand was designed by him, and is said to have been commenced 1629; GOETGHEBUER, *Mons. des Pays Bas*, fol., Ghent, 1827, p. 38, pl. 59 and 60. Interior in STAPPAERTS, *Belgique Mont.*, 8vo., Brux., 1844, i, 56. COMMISSION DE BRUXELLES, *Bulletins*, 8vo., Brux., 1848-9, xiv, 62; xv, 119. PERCIER ET FONTAINE, *Choix des—Maisons, etc., de Rome*, fol., Paris, 1824, pl. 21-6; 36-8; 52-4.

3. 24. 28. 38. 111.

SANTER (JACOB PHILIP), born 1756 at Bruneck in the Tyrol, also a good sculptor, executed the monument to Jos. von Sperges in the church of Maria Hilf at Innsbruck; carved the decorations, as capitals, window cills, columns, etc., in the Neustift at Steuvayer-thale; the high altar at Ahn; monuments to prince bishop Joseph count von Spauer in the cathedral at Brixen; designed the parish church at Antholz; and that at Bruneck, with the side altars of S. Sebastian and S. Joseph. He died 1809 in that town. 26.

SANTI; see SANCTIS.

SANTI (le chevalier ...), engineer of Siena, constructed 1629 for king Ferdinand II that part of Leghorn called "the new Venice" on account of the canals in the streets, one of which is shown in FAMIN ET GRANDJEAN, *Arch. Toscano*, fol., Paris, 1806; 1875, pl. 107.

SANTI (GIOVANNI), painter and sculptor, was the father of Raffaello Santi or SANZIO, of Urbino. 68.

SANTI (GIOVANNI DE). In the church of S. Cristoforo or Sta. Maria dell' Orto, at Venice, is the inscription "Hic jacet mag. Johannes de Sanctis, lapicida", etc., died 1392. 68.

SANTI (LORENZO), born 1783 at Siena, studied under his father, a painter of decorations; went to Rome and Venice, and was appointed architect to the king's palaces, and member of royal academy at Venice; designed the palazzo del Patriarca on the piazzetta dei Leoni; reduced the church of S. Silvestro; designed the corpo di guardia near the king's palace; with other works, as noticed in CIOGNARA, *Venezia*, fol., Ven., 1838-40, i, 84. He died 7 May 1839. SELVATICO, *Arch., etc., in Venezia*, 8vo., Ven., 1847, p. 480-4. 26.

SANTI DI TITO TITI; see TITO.

SANTIAGO DE COMPOSTELLA (Anc. Asseconia). A city in Galicia in Spain. An archiepiscopal see from *cir.* 1100-30. The cathedral dedicated to S. Jago the elder was erected 868-74, cons. 899, destroyed 997 by the Moors; entirely rebuilt from 1082 and finished before 1128. FORD following STREET states it to be a repetition with a few alterations of the church of S. Sernin at Toulouse built 1060-96. A double flight of steps at the west end leads to a chapel under the porch known formerly as Santiago la Vajo and now of S. Joseph; it dates *cir.* 1168-75,

and supposed to be the work first done by maestro MATEO. The church has a long barrel vaulted nave about 70 ft. high, aisles round the transepts, a triforium but no clearstory. The south entrance is dated 1078. The north or fachada de la Acebacheria, incorrectly commenced by Sarella, was constructed 1765 by D. A. Lois Monteagudo. The towers and west façade 1738 by F. Casas y Noboa, whose drawings are among the records; and was continued 1764 by V. Rodriguez. This covers the elaborately carved *puerta del Gloria*, consisting of three archways, carved by maestro MATEO (who is represented on the shaft of the central doorway) who was at work 1168-88, and considered by STREET to have come from Toulouse. A cast of the archways is in the South Kensington museum; Bedford Lemere published a series of 20 photos with text; also another series by T. Thompson of the cathedral published by the ARUNDEL SOCIETY, fol., 1868. A cloister dates from 1128 unfinished 1134; and a larger one 1533 richly ornamented; work was done to the capilla mayor at the same time. G. Martinez de Aranda was about 1575 maestro mayor.

The half-destroyed church of S. Agustin has a fine cloister; S. Felix de Celorio 1316 is by Martin Paris; the square belfry of S. Domingo; and the convent of S. Francisco with its chapel now a parish church, are among the best of the eight or fifteen parish and two collegiate churches. Of the five monasteries, the enormous one of S. Martin founded 912, one of the most magnificent of the Benedictine order, partly overhangs a ravine, and is much modernized; the entrance 1738 by F. de las Casas y Noboa; the grand patio rebuilt 1636-1743; it was formerly used as barracks, etc.; its chapel now a parish church has a fine renaissance *coro*. Of the three hospitals, the hospicio de los reyes has four courts, designed 1504 by H. de Egas. The large seminario 1777, has the casa ayuntamiento on the ground floor. Episcopal palace; university founded 1532, a heavy building; town house after the model of the palace at Madrid; college of archb. Fonseca founded 1544, now suppressed; and the theatre, are among the other noticeable erections. The bridge over the river Tambre, near Sigueiro, near Santiago, was completed by F. Perez de Andrade, as recorded on the coat of arms, the date is destroyed. *Historia Compostellana in ESPANA SACRADA*, vol. xx. STREET, *Gothic Arch. in Spain*, 8vo., London, 1865, p. 140-59. ECCLESIOLOGIST *Journal*, 1849, ix, 102. MOSQUERA, *Monografia de S.*, 4to., 1850. FERGUSSON, *Hist. of Arch.*, ii, 127-8. 14. 28. 50. 66. 96.

SANTIAGO (It., *S. Giacomo de Chili*). A city founded 1541 and now the capital of the republic of Chili, in South America. It is situated on the river Mapocho, over which is a good stone bridge of eight arches. The houses are extensive, being arranged around an open patio and one story only high on account of the earthquakes. The streets are paved with river pebbles and the pavements 9 ft. wide with red porphyry from the hill of San Cristoval.

The cathedral de la compania, dedicated to the Assumption of the Virgin, was burnt 8 Dec. 1863, the site is now laid out as a garden and cemetery. A new cathedral was commenced in 1870. There are numerous other churches; the mint now partly occupied as the president's palace and as offices; the archbishop's palace (Moorish); the house of congress, in *L'Illustration*, 1858, Sept., p. 176; university founded 1738; the market place 160 ft. square chiefly of cast iron by Laidlaw and Son of Glasgow, *BUILDING NEWS Journal*, 1870, xix, 161; and the fort of Sta. Lucia. 14. 50. 96.

SANTIAGO (MARTIN DE), a Dominican, designed and commenced 1551 the church and monastery of S. Telmo in the city of San Sebastian in Spain. 66.

SANTIAGO-GUATUSCO, nine miles east of Cordova, in the province of Vera Cruz, in Mexico, has a *teocalli* of three grades having on one side a wide staircase leading to the summit; GAILHABAUD, *Monuments*, 4to., Paris, 1850, iv.

SANTINI (DOMENICO) with A. Poggi, designed the monte di Pietra at Ferrara 13 Sept. 1756—8 April 1781

SANTINI (VINCENTO), rebuilt 1717 nearly the whole of the church of S. Domenico at Bologna. "The two Santinis" carried out 1710-38 the church of SS. Cosmo e Damiano from the design of F. Mazzarelli; and 1758 that of S. Matteo, both at Ferrara. "The two Santinis of Arezzo", are mentioned. 68.

SANTINI (FRANCESCO), born 1763, also a painter, pupil of G. Jarmorini, practised at Bologna, where he designed 1805 the teatro del Corso; 1821 the decoration of the cappella S. Ignazio di Loiola, in Sta. Lucia; 1825 the casa of maestro Rossini ora Salina; the palazzo San Giorgi, and many others. In 1809 he was professor of architecture in the accademia di belli arti. He died in 1840. 68. 105.

SANTISTEBAN (JUAN), of Guipuzcoa, 1551 constructed the great chapels of the church, the staircase and other works of the monastery of S. Telmo, in Santiago de Compostella. 66.

SANT MARTI (GASPAR DE), carmelite calzado of Valencia, also a sculptor, is mentioned under 1631 and 1638; and 1644 he designed and directed various works at his monastery and church. 66.

SANTORIN (Anc. Thera). An island of the Cyclades, Eastern Greece, chiefly volcanic. It supplies a puzzolana richer in silica than that of Italy or Germany (Andernach). The analysis made by Elsner is given in *BUILDER Journal*, 1874, xxxii, 800; and in REID, *Concrete*, 8vo., London, 1869, p. 18-9. In 1851 Greece sent a specimen to the Exhibition of Industry, which was ash coloured. A prehistoric Pompeii at Theraskia, near Santorin, was discovered 1869 by F. Fouqué; *BUILDING NEWS Journal*, 1875, xxix, 580. PITTON DE TOURNEFORT, *Voyage*, 8vo., London, 1741, i.

SANTOS (EMMANUEL RENAUD DOS), of Portugal, succeeded 1775 Michel Ange de Velasques as architect of the public works. He designed the church of the Martyrs, and that of the Heart of Jesus, and the fountain of the Janelas Verdes. He died about 1790. 88.

SANTOS (RENAUD EMMANUEL DOS), architect of the public monuments at Lisbon; 1775 moved the equestrian statue of king Joseph; DENIS, in *L'Univers*, livr. 1366, p. 405, etc. 88.

SANTOS DE CARVALHO (EMMANUEL RODRIGUEZ), of Portugal, practised at Rome and Naples; 1741 designed the church of Sta. Trinità, strada Condotti, at Rome; 1751 directed the funeral of Jean V, engraved in 20 plates. 88.

SANTOS DE CARVALHO (EUGENIO DOS) designed after 1755 the new part of LISBON; and the new palace in the Campolide, together with Giov. Antinori of Rome (CYRILLO); also the buildings around the praça do Commercio; and designed an equestrian statue of king José I, erected 1775. 88.

SANTOS DE CARVALHO Y NEGREIROS (JOSÉ EMMANUEL DE), his son, born 1751, was made 1804 architect by brevet to the royal palaces and to the monastery of Batalha. He died in 1815. He is not the same as Ein. da Costa Negreiros who died 1750. 88.

SANZ (AUGUSTIN), born 29 December 1724 at Zaragoza, studied under Raymundo Cortés, maestro mayor of the city, and others, and later under V. Rodriguez when he was engaged on the capilla del Pilar in that city. In 1775 he was elected a member of the academy of S. Fernando; 1778 teacher in the school of drawing; 1792 director of the academy of S. Luis, having given instruction in architecture previously, and did much towards introducing a better style. He was appointed to inspect the designs for all the new public edifices in Aragon. The most important of the works by him are, the parish church of Sta. Cruz (Greek cross) at Zaragoza; the casa de las infantes del Pilar, to the church of which he was maestro mayor, the central cupola over the coro from the design of V. Rodriguez; the dam built in the drain of the Ebro near S. Lazaro; the new wing of the infirmary for convalescents; the oil mill with six conduits for M. de Goicoechea; and various houses in Zaragoza; outside which city, the churches of Urrea (elliptical) and of Binaces, both for the duque de Híjar; that of Epila, the façade of which with an attic and two towers was added by

ARCH. PUB. SOC.

his son don MATIAS SANZ; the round church of Puebla de Híjar, renewed with a cupola; the public inn of Areca; another in Borja; and some others throughout Aragon; the parish church of Fraga; the offices, barracks, bridges, and the comedy theatre in Zaragoza. S. Perez was a pupil. He died 25 July 1801. 14. 66.

SANZIO, properly Santi or de' Sancti (RAFFAELLO), born 26 (astron. tables) or 28 (Julian calendar) March 1483, at Urbino; studied under L. Signorelli, T. Vite, and P. Perugino of Perugia, from the latter and his supposed relative Bramante Lazzari he also learnt architecture. He was also a sculptor. He painted the library of Siena cathedral for B. Pinturicchio; went 1504 to Florence; and then to Rome, where Bramante introduced him to pope Julius II (1503-13); above his picture in the chamber of the Segnatura was one by G. A. Sodoma having arabesques; in 1511 the first hall was completed; 1515 half the works of the great or second hall on the upper floor, completed 1517 for pope Leo X, containing the victories of Constantine.

Beyond these works only Raphael's architectural works will be here noticed, which are nearly all contained in PONTANI, *Opere Architettiche di R. S.*, fol., Rome, 1840-5. The cathedral at Città di Castello was supposed by PONTANI to be 1503-33 by Bramante Lazzari, but is by Elia di B. Lombardo; he 1507-9 designed the church of S. Eligio de' Orfani in the via S. Giovanni decollata (MUNTZ, p. 568), carried out by Raphael, rebuilt 1601; who 1513 bought a palazzo for himself in the Borgo Nuovo having stuccoes by Bramante; and designed cir. 1513-20 another casa in the Borgo Nuovo for Giov. Battista dall' Aquila (later Brancioni), having stuccoes by Giov. da Udine (2 pl. in P., and in FERRIERO, *Palazzi di Roma*, fol. (1655), pl. 15, who apparently gives the former for the latter): both were demolished for the colonnades and approach to S. Peter's: LETAROUILLY, p. 768. Bramante (died 12 March 1515) becoming infirm was succeeded at S. Peter's 1 Jan. 1514 by G. da Sangallo. On 1 April 1514 (FEA) and 1 Aug. 1515 Raphael was nominated by the pope "director of the construction of S. Peter's and superintendent of the ancient edifices of Rome", also 27 Aug. 1516 when he was appointed "general inspector of all excavations and discoveries of stone and marble within the circumference of ten miles", until 1 April 1520 at a salary of 300 ducats (gold crowns), about £150. On 1 Feb. 1514 fra Giocondo was appointed one of the architects to S. Peter's, and advised (for fully four years) G. da SanGallo and Raphael how to underpin the foundations, and who also received a like salary: MARCHESE, *Lives*, 8vo., Dublin, 1852, ii, 154-6. Raphael assisted by Ant. Piccone da SanGallo made a model, now lost, of his design for S. Peter's, but the plan is preserved with an elevation by SERLIO, *Architettura*, fol., Ven., 1563, p. 116: and re-engraved in P. who gives a plan of the locality before the colonnade, etc., was erected: GEYMULLER, *Plans*, etc., fol., Paris, 1875, pl. 26, 35, 42, 44.

Under pope Leo X (1513-22) he at the Vatican 1514 carried up the three stages or galleries of the cortile delle loggie or cortile di S. Damaso, on Bramante's foundations, or perhaps only added the top or fourth or columnar loggia (s. v. Lazzari). Loggie and details in P., and in LET., p. 132, who considers the whole to be by Bramante following SERLIO, pp. 216-7; but VASARI attributes it to Raphael who perhaps did the west side, the two other sides being added by pope Gregory XIII (1572-85) and his successors. Raphael's decorations are in the thirteen arcades of the middle tier; the lower story was covered with stuccoes and arabesques by G. da Udine from Raphael's designs; these before 1881 were restored by sign. Mantovani.

According to his appointments in 1516 he appears to have measured the antiquities and restored some on paper. A report or memoir thereon by him in 1518 or 1519 to Leo X is usually attributed to Bald. Castiglione as it was found among his papers. Andrea FULVIO, *Antiq. Urbis*, 1527, states that Raphael drew the antiquities in pencil for his work, at his request, a short time before Raphael's death. He kept able draughtsmen constantly at work in southern Italy, and sent others to Greece. Of the

grotesche in the loggie he appointed G. da Udine superintendent, who also painted the flowers, fruit, etc. All the doors, wainscots and other portions ornamented in wood were executed and finished by Gian. Barile; the pavement of the gallery was the work of Luca della Robbia. In the "raphaelesque style" he was inspired by B. Pintelli's friezes and cornices in the corte of Urbino, designed by Laurauna for F. di Montefeltro; *MAGAZINE OF ART*, 4to, 1883, p. 435. It is also noted that the collegio or sala del Cambio at Perugia has the interior vaulting dated 1453, and was covered with frescoes by P. Perugino, finished 1500; these arabesques are therefore noticeable as painted long before those by his pupil Raffaello at the Vatican. Morto da Feltro had excavated the tombs around Rome and Naples, and the baths of Titus had just been discovered; these Raphael is said to have adopted in their spirit and gusto (*CARLETTI, Baths; VOLPATO, Loggie*; Q. de QUINCY, p. 263-8). Arabesques were also employed by M. Sannicchiele at the Pellegrini chapel some time before, but not of good design. ARABESQUE. GROTESQUE. In the royal library at Munich is a translation of Vitruvius by Fabio Calvo of Ravenna, made in the house and at the instigation of Raphael, probably to assist his studies in architecture.

The ten Cartoons were drawn 1515-6; the architecture in the School of Athens was probably sketched by Bramante; also the backgrounds of most of the frescoes; the circular temple shown in the picture of the Sposalizio di Madonna is given by P.; as is also the church of Sta. Maria in Dominica anche della Navicella (*LET.*, p. 150, pl. 5); and a casa in Borgo S. Pietro, with details. He designed 1515 the pal. Gio. Alberini, piazza di Bianchi, afterwards in the Borghese family, (also attributed to Giulio Romano); *FERRERO, Palazzi* (1655), pl. 37-9; and *SANDRAET, Palat. Rom.*, fol. 1694, ii, pl. 5. At the church of S. Pietro dei Cassinesi at Perugia, he designed the ornaments for the choir, carved in wood by S. da Bergamo; *GALASSI, Gli Ornati del coro*, etc., fol., Rome, 1811; 1845. The loggia at the Casino di villa Madama at Montemario, plan and elevation in P.: this was the vigna or villa for cardinal Giulio de' Medici afterwards pope Clement VII, and finished by G. (Romano) Pippi after his own designs; *SERLIO*, plan, etc., 220-1, 235; *GRUNER, Fresco decorations*, 1844, text, 33; *PERCIER ET FONTAINE, Maisons*, 1809, pl. 39-42.

Raphael went Nov. 1515 with the pope and Buonarroti to Florence to make designs for the façade of the church of S. Lorenzo; a copy of an original sketch in the Crozat collection is given in P., as well as one drawn out from it; *ALGAROTTI* states he copied a drawing of it when it belonged to baron von Stosch; *COMOLLI, Vita*, 72: as well as a palazzo given by Ant. Lafrerio 1549 from one in the Corsini library. The palazzo degl' Uguecioni, piazza di Granduca, P., with details, is ascribed to Palladio by FAMIN, and by others to Buonarroti; *RUGGIERI, Scelta*, etc., fol., Fir., 1755-6, i, 71: 1520 the palazzo Pandolfini, (later Nencini), Strada Sangallo, executed after the death of Raphael by G. F. da Sangallo (Aristotile), and 1530 completed by Bastiano Aristotile, P., 2 pl., plan and details; *FAMIN, Arch. Tosane*, fol., Paris, 1809; and 1875-8, pl. 33-6: *RUGGIERI, Studio*, fol., Flor., 1724, ii, pl. 73-5, gives a window and cornice.

At Rome, he designed the capella dei Agostini Chigi of Siena in the church of Sta. Maria del Popolo; P. with details; *RUBEIS, Altari*, fol., Rome (.....), gives two sides, pl. 2-3 (attributed by LETAROUILLY to Peruzzi); and to Raphael is attributed the design of the cartoons therein painted by Seb. del Piombo, and also a share in the sculptures. 1513-15 the palazzo Coltrolini, later Caffarelli, and then Stoppani, now Vidoni, for Batt. dall' Aquila, opposite the church of S. Andrea della Valle; P.; *ROSSI AND FALDA, Palazzi*, fol., Rome (1655), pl. 17; *LET.*, 554, pl. 267; attic added by Sansimone. A palazzo for Bern. Caffarelli by L. di Ludovico, his pupil. The villa del Papa, or casino di Villa Madama, with the assistance of Giulio (Romano) Pippi; *PERCIER ET FONTAINE, Choix des Maisons*, fol., Paris, 1824, pl. 39-42; P., with another design from *SERLIO, Archit.*, 1563. Palazzo on the piazza di Montevecchio, P. The

casi or stalle (MILIZIA) alla Longara for A. Chigi, P., (facing the pal. Farnesina by B. Peruzzi), the paintings by Seb. del Piombo and by Raphael 1511-14. Loggia in the gardens of the Farnesina, P. with details. Loggia of the palazzo delle Convertendi P.; it is said to be the house bought by Raphael from Bramante (see LAZZARI, p. 45) for 3,000 ducats, and wherein Raphael died; it became the palazzo Spinola, then degli Eretici Ravveduti or degli Convertiti since middle of XVII cent.; it stands between the church of S. Giacomo Scossacavalli and the piazza of S. Peter's. The so-called casino or villa of Raphael about half a mile from the porta del Popolo, praised by EATON, *Rome in the six cent.*, 5th edit. (Bohn), 1852, is stated not to have been his, to have been called villa Olgiati, and destroyed 1849. The palazzo Costa, later Colonna and Ceva, in the via di Borgo Nuovo, is attributed to Raffaello as well as to B. Peruzzi; (*LET.*, p. 180, pl. 43).

His pupils in architecture were Giulio Pippi, known also as Giulio Romano; and Lorenzo di LUDOVICO usually called Lorenzetto. He painted four portraits of himself in the frescoes of the Vatican, one of which is usually engraved. He died 6th April 1520, aged 37, and was buried in Sta. Maria Rotondo, at Rome. The house in which he was born at Urbino was 1871-3 purchased for £1,000 for a museum; *BUILDER Journal*, 1871, xxix, 709; xxxi, 300. 3. 5. 25. 28. 30. 68. (243 pages). 73. 105.

Ornaments. *GRUNER, I Freschi nella Cappella della Villa Magliana, fuori di porta Portese di Roma*, etc., fol., 1847. *GRUNER, The Caryatides from the Stanza dell' Eliodoro*, fol., 1852. *GRUNER, Fresco Decorations and Stuccoes of Churches*, fol., 1854. Paintings of a domed coved ceiling of the stanza della segnatura, pl. 80; and from Bath room in the Vatican for cardinal Bibbiena, are given in *GRUNER, Ornamental Art*, fol., 1850, pl. 79. *LETAROUILLY, Le Vatican*, etc., 3 lar. fol. vols., Paris, 1882.

PISTOLESI, Il Vaticano, fol., Rome, 1829-38. *Loggie del Vaticano* by VOLPATO and others after drawings by Camporesi, 43 prints, large fol., Rome, 1772-77. Same, 95 large fol. pl., Roma, 1772-90. *I Freschi delle loggie Vat.*, by VALENTINI, 41 pl., fol., Rome, 1855. *LANFRANCO, Disegno della Loggia di S. Pietro in Vat.*, by P. SANTI BARTOLI, 18 pl. of ornaments, fol., n.d. *Les Loges de Raphael*, 52 pictures by de Meulemeester and Calamatta, text by baron F. de Reiffenberg, 52 pl., large fol., Brux., 1845-53. *CHEREAU AND JOUBERT, Pilasters and Stuccoes of the loggie*, fol., Paris, 1787-90. *Recueil d'Arabesques*, etc., fol., Paris, 1802. *PIRANESI, Opere*, fol., Rome, 1835-37, vols. 21-5. *PAPWORTH, Specimens of Decoration*, 4to., London, 1844.

Best general life, etc. *VASARI, Vita*, fol., Rome, 1751; transl. by DARET, 4to., Paris, 1607; 1651; *Lives*, 8vo., London, 1851, iii, 1-64. *DUPPA, Life*, 8vo., 1816. Q. DE QUINCY, *Hist. de la Vie*, etc., 8vo., Paris, 1824; 1833; 1835; transl. by LONGHENA, 8vo., Milan, 1829; and transl. 8vo. (Bohn), London, 1846, pp. 323-334. *MUNTZ, Raphael; sa Vie, son œuvre et son temps*, Paris, 1881, p. 561-85; transl. by ARMSTRONG, 8vo., London, 1882; comprises *Raphael as an Architect*, by GREYMULLER, p. 554-60. *CROWE AND CAVALCASELLE, Raphael; his Life and Works*, 8vo., London, 1882; *WARING, Trio of Painters*, *BUILDING NEWS Journal*, 1872, xxii, 146; *ZERFF, Raphael*, etc., *idem*, 1876, xxx, 514 and plate; 643 and plate. *SOMMER, R. as an Architect*, read at Frankfort, March 1883; *BUILDER Journal*, 1883, xlv, 565.

Life, etc. *BOMBOURG, Recherches*, 1675; 1709. *COMOLLI, Vita*, 1790; 1791 enlarged; *BRAUN, Leben*, 1815; 1819. *FUESSL, Leben*, 1815. *FEA, Not. intorno*, 1822. *PUNGILONE, Elogio storico*, 1822; 1829. *REHBERG, R. S.*, 1824. *Della Vita*, by Vassari, Bellori and Missirini, 1825. *RIEPEHAUSEN, Vita*, 1833; *PASSAVANT, R. von Urbino*, 3 vols., 1839-58. *HARFORD, Life of M. A. B.*, and *memoirs of R.*, 1857. *WOLZOGEN, Leben*, 1865. *RUMOHR, Rafael*, 1831.

SANZIO; see SANTEN (JAN VAN).

SAP, sapwood; see ALBURNUM; see HEARTWOOD. In stone, see QUARRY DAMP. LISTED.

SAPAN WOOD; see CESALPINIA SAPAN.

SAP GREEN, verde vessie, and bladder green from being usually preserved in bladders. A vegetable pigment prepared from the juice of berries of the buckthorn, green leaves of the wood, blue flowers of the iris, etc. It has little durability in water-colour and less in oil. GREEN. 23.

SAPHETA; or SOFFIT. "The board over the top of a window placed parallel and opposite to the window stool at the bottom"; NICHOLSON, *Dict.*

SAPODILLA WOOD; FAGARA. A timber obtained in British Honduras, which is close grained, dense and hard, and weighs about 75 lb. per cubic foot. It grows abundantly and barks may be obtained 30 to 40 ft. long and 13 to 14 in. square. It was used 1860 in a bridge over the river Belize, where the old one of same timber had been in use for forty years, great part being still good. *BUILDER Journal*, 1860, xviii, 757.

SAPOTE or ZUPORTE is the wood used exclusively in the buildings at CHICHEN or Chichen-itza for lintels and thwart beams.

SAPOTEA. A wood of East Indies; see PALAEPAN and BASSIA, which is comparatively free from attacks of the teredo; and is valuable where not exposed to the air, and also under water; *BUILDING NEWS Journal*, 1856, p. 804.

SAPRU HOUT; see CALLITRIS.

SAPULACIONEM; see SCAPULATIONEM.

SARABIA (RODRIGUEZ). One of a junta of architects assembled 1512 by the bishop of Salamanca to report upon a plan for the cathedral. 66.

SARACENIC ARCHITECTURE. The name adopted by FERGUSSON for the style called by most other writers Arab or Arabian, Moorish, and MAHOMEDAN ARCHITECTURE. This name, used by PROBLEMY and PLINY in a narrow sense, but by AMMIANUS and PROCOPIUS in a larger sense, is applied by PROBLEMY to an obscure tribe on the borders of Egypt, to the west and south of Arabia. They are not unlikely to have been the Characeni or Arraceni of PLINY, *Hist. Nat.*, vi, and the wanderers in the desert region which STRABO calls Ararena. The opinion of CEL-LARIUS that the name is connected with the Sahara, or desert, would be so evidently applicable as perhaps to constitute a national designation rather than the distinction of a tribe. ECHARD, *Roman History*, 1699, 4th edit., ii, 304, calls the Arabs "Saracens"; and OCKLEY, *History of the Saracens*, 1708-18, pref., says, "The whole dominion of the Saracens, being first carried into Africa, and from thence into Spain." GIBBON, *Decline and Fall*, 1776-82, writes, "From Mecca to the Euphrates, the Arabian tribes were confounded by the Greeks and Latins, under the general name of Saracens."

"The system of a Saracenic origin of the pointed style has, out of mere compliment to the name of its author (Sir C. Wren) been adopted by bishop Lowth, Riou, Warton, Grose, and the generality of modern writers, who have had occasion to enter upon the subject"; MILNER, *Treatise*, 8vo., London, 1811, p. 54. BYZANTINE; EGYPTIAN, and ITALIAN Architectures.

As but little is said, *s. v.* Mahomedan, of Saracenic art in Italy, it may be well to name the following places which were influenced by them for good or for destruction, as Bari, Capua, Cumæ, Poestum, Atrani, Pozzuoli, Ravello, Lucera, Nocera, Otranto, Piacenza, Trani, Manfredonia, Genoa, Verona.

Norman Saracenic Architecture in the island of Sicily, by GRANVILLE, in *BUILDER Journal*, 1846, iv, 462 doorway from Favara; 557 doorway at Lagabia, Girgenti; and 605 windows from Palermo cathedral, and at Girgenti. *Saracenic Architecture at Venice*, XIV cent., *idem* 1847, v, 472. *Cairo* by LEWIS, *idem* 1859, xvii, 185; 262. RAMÉE, *Hist. de l'Arch.*, 8vo., Paris, 1843, ii, 433-41. WILKINSON, *The Saracenic Style distinct from the Byzantine*, *BUILDER Journal*, 1861, xix, 193; 205. REINAUD, *Mons. Arabes, etc.*, du cabinet de M. le duc de Blacas, etc., 8vo., Paris, 1828: *Desc. des Mons. Musulmans du cabinet*, etc., 8vo., Paris, 1828; *Invasions des Sarrasins en France, etc.*, 8vo., Paris, 1836: *Relation des Voy. faits par les Arabes, etc.*, dans l'Inde et à la Chine, 8vo., Paris, 1845. FREEMAN, *Hist. and Conquests of the Saracens*, 2nd edit., 8vo., 1876.

SARACINESCA CONSTRUCTIO. Small pieces of tufa of a parallelogram form were used for facing the concrete walls from the very earliest period.—It was extensively revived in the middle ages under the name of Opera Saracenesca and is the common mode of facing a wall from IX to XV cent. It is supposed to have passed from Rome to Byzantium and from thence into many eastern countries, and to have been largely used by the Saracens in their fortresses and by them brought back to Rome in IX cent., if it really ever went out of use there. It was adopted very commonly for the castles and houses of the barons of the middle ages, as in the castle of Hildebrand, XI cent., in the Trastevere: in the castle of the Gaetani around the tomb of Cecilia Metella and in the castle of the Savelli on the Aventine in XII, XIII, and XIV cent.; and in the buildings of the monastery of S. Sisto Vecchio in VII cent. (illust. S. Sixtus vetus Monast. A.D. 850); PARKER, *Different Modes of Construction in ancient Roman buildings, etc.*, Lecture, 8vo., Rome, 1868, p. 17. PARKER, *Walls of Rome*, 8vo., Oxford, 1874, p. 24. "Finalmente (Præneste, Palestrina) come città de' bassi tempi mostra alcune torri rotonde di piccioli rettangoli di pietra, opera conosciuta sotto il nome di costruzione Saracinesca;" NIBBY, *Viaggio Antiquario*, 8vo., Rome, 1819, i, 284; 290.

SARAGOSSA; see ZARAGOZA, in Spain.

SARASTI (MARTIN DE), maestro of the stone masons at the Escorial in 1626; possibly the M. de Sagasti employed 1620 to roof in the pantheon, under G. B. Crescencio and P. Lizargarate. 66.

SARAVEZZA MARBLE; see SARAVEZZA MARBLE.

SARCOPHAGUS. The name given to a stone Assius lapis found at Assos in Troas, according to Pliny, *H. N.*, ii, 98, xxxvi, 27, and of which tombs were made on account of its caustic qualities, which consumed the body in forty days. LOCULUS.

It is also the name given by the Greeks to a sort of coffin or grave; a sepulchral chest; made of any material; of various sizes; and more or less enriched with ornament and sculpture. In the marble sarcophagus found in the Monte del Grano, near Rome, and supposed to have been appropriated to Alexander Severus (died 235) was found the vase, now known as the Portland vase. "The earliest Christian tombs at Rome are the *loculi* in the catacombs large enough to contain a corpse. The *arcosolia* or altar tombs are no doubt generally of later date; in these sarcophagi are sometimes found, the bodies within which are swathed in bands of linen. Numerous marble sarcophagi sculptured with Christian subjects are to be seen in the museum at the Lateran and elsewhere in Rome; they may range in date from the III to VI century, and are rarely very rude"; NISBETT, *On the Churches of Rome earlier than the year 1150*, in *ARCHÆOLOGIA*, 1866, xl, pt. 1, 216. The most elaborately sculptured Christian sarcophagus that Rome possesses is that of Junius Bassus, prefect of the city, who died 359; it was discovered in the crypt of S. Peter's in 1595; *BUILDER Journal*, 1863, xxi, 562, *Roman Sepulchres*. The body of Alexander was buried B.C. 323 in a golden sarcophagus; said to have been stolen by Seleucus, son of Antiochus Grypus.

In the hall of the Greek Cross, in the museum of the Vatican, at Rome, are two immense sarcophagi of red Egyptian porphyry; one of Constantia (died 354) daughter of Constantine, and found in her tomb near the church of S. Agnese fuori le Mura; and of the empress Helena (589) in her tomb now called the torre Pignattura beyond the porta Maggiore: they took twenty-five artists about twenty-five years to restore. In the Vatican is also the sarcophagus of peperino bearing the name of L. Scipio Barbatus; it was discovered 1780 in one of the larger chambers of the family sepulchre on the via Appia, near the porta di S. Sebastiano; PIRANESI, *Mont. degli Scipione*, fol., 1785. *BUILDER Journal*, 1863, xxi, 562. The bronze ornaments are modern of the one of porphyry in the basilica of Sta. Maria Maggiore; REVELEY, MS. Dict. at Roy. Inst. of Brit. Architects. An Egyptian sarcophagus of deep green breccia or porphyry, in the British museum, (obtained at Alexandria), as well as some others, all of XXVI-XXX dynasties. Another of arragonite or

alabaster from Thebes, in Sir John Soane's museum; SHARPE AND BONOMI, *The S. of Oimeneptah*, 4to., London, 1864. Several Roman and Etruscan examples are in the British museum. A sarcophagus discovered in Palestine is now in the Louvre, *Builder Journal*, 1862, xx, 161-2. Many Roman ones exist at Ravenna; Reims, 9 ft. by 4 ft.; Pisa; LASINIO, *Raccolta di Sarcophagi, Urne, etc., del Campo Santo di Pisa*, 1814. MOSES, *Collection of Antique Vases, etc.*, 4to., 1814. SMITH, *Dict.*, s. v.; and s. v. funus, p. 556: s. v. assos. 6. 14. 25. 28.

This term is applied by GAILHABAUD to an altar tomb.

SARDA or SARDAS, represented by Bougie, Bujeya, Bujiah, or Boujeiah, in Algeria. The AQUEDUCT (s. v. Detached Essay, p. 1) is now destroyed. Plan of town and surrounding country, pl. 4; and a plain mosaic pavement, pl. 7, of DELAMERE, *Explor. Scientifique*, 4to., Paris, 1853.

SARDES or SARDIS. The ancient capital of Lydia, now represented by SART, a miserable village in Turkey in Asia. It was situated on the river Pactolus. The acropolis on a steep sandstone rock was taken by the Persians under Cyrus, when under Croesus its last king (B.C. 560-546) it was a rich and splendid city. Of the large temple to Cybele, built on the banks of the river, and said to have been erected about 300 years after the temple of Solomon, only three columns of the Ionic order are now standing, half buried. It was destroyed 501 by the Ionians. Traces exist of an amphitheatre and of a stadium near it; the former 396 ft. external and 162 ft. internal diameter; ATHENÆUM *Journal*, 1869, pp. 466, 505: also the remains of a building of uncertain use, called the Gerusia. The city was one of the seven churches of Asia mentioned in the book of Revelations. There are remains of two Christian churches, one of which was built of stones from older edifices. Near the lake Gygeus, four miles northwards, are the burial places of the Lydian kings; the barrows are of various sizes; the large one being called the mound of Halyattes the father of Croesus. CHANDLER, *Travels*, 4to., Oxford, 1775. 14. 23. 28. 50.

COCKERELL, in LEAKE, *Asia Minor*, 8vo., London, 1824, pp. 265, 328, 342-49, 352, who saw eight columns, three having capitals; while KIEPEL, *Balkan*, 8vo., London, 1831, ii, 326-8, saw only two. Dennis in Feb. 1883 was stated to have bought the site of the temple and would begin to excavate. FERGUSON, *Temple, etc.*, at ROY. INST. OF BRIT. ARCHTS., *Sessional papers*, 1882-3, pp. 155-6. MACFARLANE, *Constantinople, etc.*, 4to., London, 1829, pp. 210-1. ARUNDEL, *Asia Minor*, 8vo., London, 1834, i, chap. 2. ARUNDEL, *Seven Churches*, 8vo., London, 1828, p. 175. PULLAN, *Cat. of Views*, four photos., 1876. W. R. GREG, *On the Sepulchral Monuments of Sardis and Mycenæ*, read at Lit. and Phil. Society of Manchester, CIVIL ENGINEER, ETC., *Journal*, 1842, v, 219. FELLOWS, *Asia Minor*, 12mo., London, 1852, 2nd edit.

SARDI (GIUSEPPE), "of Morco in der landvogtei Lauis" (68), practised at Venice. In 1673 he designed the façade and hospital, pl. 35) of the church of the spedale di S. Lazzaro de' Mendicanti, ora spedale civico, designed by V. Scamozzi (CICOGNARA, *Venezia*, fol., Ven., 1840, ii, pl. 163, p. 41). SELVATICO, *Venezia*, 8vo., Ven., 1847, pp. 427-8, also names the façade della scuole di S. Teodoro (pl. 40); façade (pl. 10) of S. Salvatore, the church of which was commenced by G. Spavento; façade of the church di S. Maria di Nazareth Carmelitani Scalzi (pl. 11) by B. Longhena; 1670 or 1680-83 church of Sta. Maria Zobenigo (pl. 15); palazzo Savorgnan (pl. 89), ora Galvagna in Canal regio; a memorial to Gir. Cavazza in the Contarini chapel in Sta. Maria del Orto; and the monument to Alvise Mocenigo, died 1654, in the chiesa dell' Ospedale. The palazzo Surian in Canal regio (pl. 88) is also given in CARLEVARIS, *Fab. e Vedute di Venezia*, fol., Ven., 1703, to which work the plates refer. He died 1699 at Venice (68). 5. 26. 30. 68.

SARDI (GIUSEPPE), practised 1710 at Rome, where 1718 he restored the portico and façade of the church of Sta. Maria in Cosmedin; GAILHABAUD, *Mons.*, pl. 62: 1744 rebuilt the church of S. Pasquale; and that of SS. Quaranta Martiri, or SS. Quattro Incoronati. LETAROUILLY, *Rome Moderne*, 4to., p. 210. 12. 68.

SARDINIAN GRANITE. Of this material are the piers and columns 3 ft. in diameter in one piece, in the baptistery at Pisa; TAPPEN, *Prof. Observations*, 8vo., London, 1806, p. 70.

SARELA (.....), incorrectly commenced the porta Acebacheria or north entrance to the cathedral at Santiago di Compostella, in Spain. It was continued 1764 from the design of V. Rodriguez, by D. A. Lois Montegaduo, he being then maestro mayor.

SARKING. The term "sarkyngbordes" occurs 1457-8 in the *Fabric rolls of York Minster*, by SURTEES SOCIETY, 8vo., Durham, 1859, p. 352; and "sarkinge about the chime, etc.", in 1581-2; p. 118. "The roofs are sarked, i.e., covered with inch-and-half deals sawed into three planks and then nailed to the joists, on which the slates are pinned"; PENNANT, *Tour in Scotland*, 4to., London, 1790, 5th edit., i, 148. It is also used for thin boards for lining, i.e., matchboards.

SARNACUS, wrote a treatise *On the Rules of Symmetry*, as mentioned in VITRUVIUS, vii, pref., s. 14. His country and period are uncertain.

SARONA (DOMINGO), a citizen of Tortosa, who after the death of B. Oger, enlarged 1545-62 the parish church of Reus, near Tarragona, by a chapel and the tower (completed 1566) on the right hand of the nave; and three chapels on the left hand. 66.

SARONO (LUIGI DA), was employed 14 Sept. 1399 upon the works at Milan cathedral. 27.

SARPI (fra PAOLO), designed the anatomical theatre at Padua, built 1594 by the surgeon Fabricius at Aquapendente; it is the oldest in Europe. A.P.S.

SARRACIO. The sawing of timber: used in the Account rolls of *Finchale Priory*, 1468-9; SURTEES SOCIETY, 8vo., Newc., 1837, p. 445, giving the names used 1532 at Durham, for the scantlings into which timber was sawn.

SARRANCOLIN; see SERANCOLINE MARBLE.

SARRASINE. A sort of portcullis, also called "horse", hung with a cord over the gate of a fortification and let down in case of surprise. PORTCULLIS. 2.

SARSEN STONE; grey-wether, and Druid sand-stone. The origin of the word is unknown. A detached boulder, a peculiar class of siliceous stone of a very hard and close texture, found as a local deposit in the valleys between Salisbury and Swindon, in Wiltshire. They are also found in parts of Berkshire and Buckinghamshire; and usually on or near the surface, although sometimes at a depth of 40 ft., and of sizes to nearly 25 ft. long. The stones at Stonehenge are the same class as at Avebury, the difference being that at the latter place the stones are rough or in their natural state, while at the former all the stones of the two great groups are hewn and fitted with very considerable nicety; FERGUSON, *Rude Stone Monts.*, 8vo., London, 1872, p. 92. They have also been called "cor-stones", NOTES AND QUERIES *Journal*, 1864, 3rd ser., vi, 456; 523; vii, 43; also 1st ser., xi, 228, 369, 494.

SARSKOE-SIELO; see Zarsko-Selo, near PETERSBURG.

SART; see SARDES, in Asia Minor.

SARUM. The Sorbiodunum of the Romans, where met many of their roads. A site near Salisbury, in Wiltshire, where a fortress is mentioned in the time of king Alfred. The city was defended by a wall, and within the enclosure stood the cathedral commenced by bishop Herman and completed by his successor Osmund 1078-99. The see was removed 1220 to SALISBURY. In the time of Leland (cir. 1530) there was no inhabited house. The materials of the old church demolished 1331 are stated to have been used at Salisbury to strengthen the tower for the spire, and for building the wall of the close. William de WENDA or WANDA, dean 1220-37, as s. v. Salisbury; LEDWICH, *Antiquitates Sarisburienensis*, 8vo., 1761, gives a plan temp. king Stephen. *Authentic account of Old and New Sarum*, etc., 8vo., 1795. HOARE, *Ancient Wiltshire*, fol., London, 1812-21. The dryness of the weather in 1834 enabled the form and dimensions of the church to be ascertained; GENTLEMAN'S MAGAZINE, *New*

Ser., ii, 418. Plan in *ECCELSIOLOGIST Journal*, 1846, iii, 101, and previous.

SARZANA. The capital of the province of Levante, in north Italy, near Spezia. The massive walls date in the xv century, when the place was exchanged for Leghorn; the fosses of the massive castle are filled up. The see was removed 1465 from LUNA. The duomo, dedicated to the assumption of the virgin Mary, is of white marble, has three aisles, and was enlarged and decorated 1355-1415 (Italian Gothic). The church of S. Andrea cir. 1198-1216; the palazzo pubblico and a new theatre deserve notice. 28. 50. 96.

SASH. (Old English *sluice*. Dutch *sas*; *sasse*. Lancashire, *sheets*; a sliding sash is called *Yorkshire light* [*BUILDING NEWS Journal*, vi, 563]. Fr. *Châssis d'assemblage de la ferme*; *châssis*, i.e., groove or frame, whence "sash frame"; *croisets à guillotine*, que les Américains ont hérité des Anglais, double hung sash; *contre-châssis*, a double sash.) A movable frame or valve for holding the glass in a window opening, and formed so as to be raised and lowered. A pair of sashes are "double hung". A window opened by side hinges is a CASEMENT; by top or bottom or side hinges or by pivots, is a fanlight, or a ventilator. A "French sash" is a glazed door. BAR. FRAME. FRANKING. MEETING BAR. CONDENSATION. 1. 5. 25.

At first, the upper valve was fixed, and there are still some few old houses where it is so seen. The under one when raised was kept at various heights by means of a series of notches and a catch to hook into them. The next improvement is considered to be a Dutch invention; in this the under sash was suspended by a weight and line which moved over a pulley. The woodwork was massive and clumsy. The groove for the weight was worked out of the solid and moulded frame. An example, with its moulded mullion, of the time of James I (1604-25) from Wickham Court, Kent, is given in *BUILDER Journal*, 1847, v, 279. The earliest sash had very small panes of glass with thick frames, not mitred, but filled with square blocks at the corners; the glass was chamfered at the edges, as at Hampton Court. So late as the year 1685, as at the palace at Winchester begun by king Charles II, the windows consisted of small wooden frames, with square panes glazed in lead, with iron casements; these windows since 1811 were taken out and replaced by light sash windows. It was not until about the reign of king William III that sash windows began to prevail. In the reign of queen Anne it was set flush or nearly flush with the face of the wall outside, and the boxings for the lines, weights, etc., exposed; but in accordance with the act of Parliament 7 Anne 1709, no door frame or window frame of wood was to be set nearer to the outside face of the wall than 4 inches. REPTON, *Ancient Timber Houses*, in *BRITISH ARCHÆOLOGICAL ASSOCIATION Journal*, 1852, vii, 105-6. *BUILDER Journal*, 1884, xli, 952.

- 1519 "I haue many prety wyndowes shette with leuys gorynge vp and downe"; HORMANUS, *Vulgaria*, 4to., 1519, fol. 244.
 1668 Window frames—if a window of oak have 4 lights in it and be double rabited—3s. per light. LEYBOURN, *Platform for Purchasers*, 12mo., 1663, p. 123; and 1685, p. 147.
 1687 "Sarsnet Shash windows"; J. SMITH, *Painting in Oyl*, 12mo., London, 1687, p. 97.
 1699 "De Lorge: We had the good fortune here to find the Marshal himself. He showed us his great Sash Windows; how easily they might be lifted up and down, and stood at any height; which contrivance he said he had out of England, by a small model brought on purpose from thence; there being nothing of this *poise* in windows in France before"—near Montmartre; LISTER, *Journey to Paris*, 8vo., 1699, p. 191. NOTES AND QUERIES *Journal*, 1865, 3 Ser., vii, 449. DALY, *Revue Générale*, 4to., 1845, p. 386.
 1699 "Shash windows" at the palace at Loo; HARRIS, *Description*, 4to., London, 1699, p. 9.
 1700 "Shas frames and Shas lights"; MOXON, *Mechanick Exercises* (Bricklayer), 4to., London, 1700, p. 28.
 1702 One of the earliest specimens of the square-sashed Italian house introduced into that part of Yorkshire, is Long Hall, for Sir George Tempest, bart.; NEALE, *Seats*, etc., 4to., London, 1822, v.
 1703 and 1736 Windows of four lights double rabited; transom windows; sash frames and sash lights; NEVE, *Builder's Dict.*

ARCH. PUB. SOC.

1704 Used at Clare Hall, Cambridge, in façade next the river.

1710 "The whole house well wainscotted and sash'd with 30 sash lights"; TATLER, No. 178, May 27 to 30.

1710 Rare; A. A., in NOTES AND QUERIES *Journal*, 2 Ser., vi, 147; 175.

1742 "2 window shass, 2s. 9d."—at Chelmsford; *BUILDER Journal*, 1846, iv, 322.

1813 Not used in Sweden at the time Dr. THOMSON wrote his *Travels in Sweden*, 4to., London, 1813, p. 8.

The figure in the article BOXING OF A SHUTTER shows the plan of a sash frame, etc. Many methods of hanging sashes have been of late years patented so as to allow of their being easily removed for cleaning without the danger or risk of being got at for the purpose outside the window, as by cutting the beads, cutting the pulley stile, counterbalance weights for opening both sashes at one operation, and other methods. *Improvements in window Sashes*, *BUILDING NEWS Journal*, 1884, May, 808. J. Osborn's system of forming a hole sloping upwards to receive a knot at the end of the cord instead of the old method of nailing the lines to the edge of the sash, was rewarded at the Society of Arts, etc.; *Transactions*, 1842, liv, 115. To prevent sashes from shaking, the meeting rails should be planed a little bevelled where they meet together; and dressed off so much, that when they are pressed together in the centre by a good fastener, it, if properly set on, will cause both sheets to press firmly against the parting bead. This will completely prevent any shaking of the sashes if properly managed by the joiner. For ventilating purposes, Dr. P. H. Bird recommended raising the lower sash for 2 or 3 inches, which thereby admits air at the meeting rail; the opening at the bottom to be filled in with board or other material; *BUILDER Journal*, 1862, xx, 158. If the board be covered with baize the sash will shut down tight upon it and exclude all draught. The "Stanley" patent sash ventilator and fastener, by Edwards and Co., Brompton road.

SASH BAR. The piece of wood or metal dividing the frame into sizes for receiving the glass. They are usually chamfered; or moulded as lamb's-tongue, etc. A page of illustrations is given in *BUILDER Journal*, xi, 158, ads. Joseph Paxton's machine for making sash bars, premiated 1840 at the Society of Arts, etc., is described in *Transactions*, liii, 97. It was first extensively used in the erection of the building for the Great Exhibition of 1851: Bickley's patent horizontal sash bar 1872, requiring no paint or putty. The Sash bars invented for the various new methods of GLAZING roofs offer other varieties.

"Diminished bar of a sash", is one that is thinned on the inner edge toward the room, then on that toward the glass of the window.

SASH DOOR. A door having glazed upper panels: also a French casement when opening down to the ground. TRENDALL, *Interior Finishings*, 4to., London, 1833; 1848, pl. 6.

SASH FASTENER. A fitting usually fixed on the top of the meeting bars of a pair of sashes, whereby to secure them from being opened readily, or at all, from the outside, and to prevent shaking. The *BUILDING NEWS Journal*, 1873, xxiv, 40; 118, and 228 figures several varieties, as Lingham, Aubin, Powis and Co., Price, Walker, Cregan, Brown, Agar, Morgan, "A B C", Burstow, Ellis, Nettlefold, Meakin, Hart & Co. This fitting ranges from about 1776 to the present day. While the top sash was a fixture, the lower one was usually secured by a pair of brass hooks fixed to the side beads, which hitched on to the meeting bar when closed; both had to be lifted up simultaneously before the sash could be raised. *BUILDER Journal*, 1884, xli, 952.

SASH FRAME. The arrangement of sill and head connected by two pulley stiles in which the sashes slide.

SASH LEVER. 1876 Elsley's patent sash lever; in place of cords and pulleys for opening casements, top lights, etc.

SASH LINE. The means of connecting the sash with the weights by which the sash is raised or lowered. Patent cords attached 1844 to large plate-glass windows lasted for about twenty years.

- Austen's imperial patent sash and blind lines and imperial patent flax sash lines; established 1774.
 Buckingham Bros. patent sash lines.
 1848 Newall & Co., patent sash line improved; C. E., 1848, xi, 156.
 1876 Reynolds' special hand-span London sash line from best proved white hemp.
 Mewis's patent braided sash cord with twisted prepared copper wire centre.
 Hawkins's registered sash chain in tinned iron, and copper wire.
 1876 Hookham's patent steel ribbon sash line.
 Hurn's patent leather sash line, and patent leather line. Steel line covered with copper.

SASH POCKET. The space formed in the sash frame in which the weight runs up and down. 1863 Gurman's patent new sash pocket and fittings.

SASH PULLEY, or axle and frame pulley; see **PULLEY**. 1863 MacAdam's pulleys of porcelain or vitreous material; B. J., xxi, 63 and 311. 18.... Meakin's solid-frame oilable sash pulley. 1881, Showell & Sons' adjustable rack pulley. 1883, Kendrick & Sons' patent brass axle pulley with square or patent round end, improved pressed plate (for machine-made sashes).

SASH WEIGHT. A long round or square block of iron or lead, the two of which, hung from two sides of the sash, should weigh the same as the sash when filled with glass, so as to be a counterbalance and cause the sash to work easily up and down, by means of the lines attached to them and passing over the pulleys.

SASSAFRAS WOOD; see **LAURUS** and **ATHEROSPERMA**.

SASSANIAN or **SASSANIDE ARCHITECTURE.** A school of art in Persia. The dynasty was established A.D. 223 by Ardeshir or Artaxerxes. FERGUSON, *History of Architecture*, 8vo., London, 1865, ii, states that "One of the oldest buildings known is the palace of Al-Hadhr (HATRA), nearly west of Kaleb Shergat, built about 250; the halls are probably copies of those of the old Assyrian palaces, but had vaulted roofs necessitating a new class of arrangements. The details and round arches are rudely copied from the Roman works. The great mosque at Diarbekr seems to belong to the age of Tiridates (286-342); the framework is of a debased Roman style; but the pointed arches of the lower range look much more modern. The Sassanians retained the great tunnel-like halls of Al-Hadhr, but cut bold arches in the dividing walls, placed elliptical domes on the intersections on pendentives, and lost all trace of Roman detail. More facts and dates are required before it can be decided whether the Sassanians borrowed the style from the Eastern Romans, or whether they themselves were the inventors from whom the architects of the more western nations took the hints which they afterwards so much improved upon. It is quite certain that this style had a direct influence on the Christian and Moslem styles of Asia, which exhibit many features not derivable from any of the more western styles. The small palace at Serbistan (FLANDIN ET COSTE, *Voyage en Pers*, fol., Paris, 1844, and pl. 17, 27, 28, 38), will explain most of the peculiarities of the style; being of brick, it depended externally on stucco for its ornamentation, which has perished. It is probably of the age of Shapur, the middle of the IV century. The palace at Firoozabad (FLANDIN, etc.) dates about 450; it has three domed apartments occupying the width of the building; the style is almost an exact reproduction of that of Persepolis, or even from the ruins of the edifice called Wuswus at Warka. Khosru (Nushirvan) commenced about 550 the Tâk Kesra, at the Ctesiphon of the Greeks, the Modân of the Arabian conquerors; a great vaulted entrance with elliptic arch, 72 ft. wide, 85 ft. high, and 115 ft. deep".

Conquest of Persia by the Arabs in 641. Mashita, discovered by TRISTRAM, *Land of Monb*, 8vo., London, 1873, is considered by FERGUSON to have been built by Chosroes shortly before the Persian invasion. Sassanide coins from 210-636, in PENNY CYCLOPEDIA, s.v. Coins, p. 323a.

SASSARI (Anc. *Gurulis vetus*). A town in the north part of the island of Sardinia, built in VII century by emigrants from Turris, which had been ruined by the Longobards. Some por-

tions remain of the walls of the Pisan period 1004-1320 with square towers; five gates; and the castle dating 1330 with five towers, having on it the arms of Aragon; it is now used as barracks. The town is the see of an archbishop. The large cathedral dedicated to S. Nicola, bishop of Mira, has a modern elaborate façade. Of the four parish and twenty churches, that of La Trinità, and of Bethlehem (Byzantine style), are noticed; also the college founded 1614, the university 1765 in the former Jesuit college, municipality, and the new hospital; the governor's palace rebuilt or repaired before 1853, that of the archbishop, and of the duke dell' Asinara, are among the largest and most remarkable; the palazzo San Sebastiano; and Vallombrosa Saturnino are like the XVII century examples at Genoa; a theatre, and several fine fountains. 14. 28. 50. 96.

SASSENAYE QUARRY; see **GRENOBLE**.

SASSI (MATTEO), pupil of C. Fontana, died 10 Nov. 1723, aged 77. He restored for pope Clement XI, the church of Sta. Maria in Monticelli, at Rome, designing the façade and portico as at present. MORONI, *Diz. Eccles.*, s.v. Dottrina, p. 260. LETAROUILLY, *Rome Moderne*, pl. 150, text 339. PASCOLI, *Vita Moderna*, 4to., Rome, 1730-2, ii, 549.

SASSOLINE; see **DORACIC ACID**.

SATALAYA or **SATALIEH;** see **ADALIA**, in Anatolia.

SATIEEN or **Chatiyen.** The native name for the wood of the *Alseodora*. 71.

SATRUNJAYA. The temples of; the celebrated Jaina place of pilgrimage near PALITANA: BURGESS, *The Temples*, etc., 45 litho., fol., Bombay, 1869. TOD, *Western India*, 4to., London, 1839, p. 274.

SATURN. One of the oldest of the fabulous deities, represented as aged and decrepid, with fetters on his feet, a pruning hook in his hand, wings on his shoulders, and sometimes a child raised up in his left hand. Tatius, king of the Sabines, first built a temple to Saturn on the Capitoline hill at Rome, a second by Tullius Hostilius, and a third by the first consuls. It was situated where the via Sacra leads up to the Capitol, and was formerly called the temple to CONCORD, of which eight granite shafts with Ionic marble capitals remain on the ruins of a lofty flight of steps. This temple was the treasury of the Romans and in the cella the questors held their sittings. BRAUN, *Ruins, etc., of Rome*, 8vo., Bruns., 1854, p. 13. BURN, *Rome, etc.*, 4to., London, 1871. TAYLOR AND CRESY, *Rome*, 1821-2. DESGODETZ, *Rome*, 1682. CANINA, *Foro Romano*, 1834; and *Gli edifizi di Roma, etc.*, 1848-56. NICHOLS, *Roman Forum*, 1877. FANSON, *Excavations*, read at Royal Institute of British Architects, *Sessional Papers*, 9 June 1879, p. 201-4. 6. 28.

SATURNIA. One of the most ancient of Etruscan sites. DENNIS, *Etruria*, 8vo., London, 1848, ii, 306. The tombs in the necropolis must be regarded as the work of the aborigines. 28.

SATURNINE RED. The same as **RED LEAD** or **MINIUM**. 23.

SATYRIUS, flourished in Olympiad 130, in the reign of Ptolemy Philadelphus. He moved the obelisk of king Nectanebo, 80 cubits high, by a canal, and raised it in Alexandria at the Arsinoëum. He also wrote a treatise on precious stones. PLINY, *N. H.*, xxxvi, 14, 5; xxxvii, 24. SHARPE, *Hist. of Egypt*, 8vo., London, 1846, new edit., 200.

SATYRUS; see **PHITEUS**.

3. 5.

SAUL, **SAL**, or **MORUNG SAUL;** see **SHOREA**.

SAULGE (SAINT), in the Nivernais, in France. Near it, the ruins of a Gallo Roman town, of great extent, were 1844 found in a large forest; a temple, forum, many streets; vases, pottery, and objects of sculpture, were discovered. CIVIL ENGINEER, etc., *Journal*, vii, 92.

SAUMUR (Anc. *Salmurium*). A town in the department of Maine et Loire, in France, situated on the river Loire, over which, the pont Neuf of twelve arches each of 60 ft. Fr. span, erected 1756-70 by de Vogli, is given in the work of CESSART, *Descr. de ses Travaux Hydrauliques*, 2 vols., 4to., Paris, 1806, i, 47-223; and the pont Fouchard of three segmental arches over the river Thone. The old square donjon of the castle, with

a tower at each angle, is now used as an arsenal. The church of S. Pierre, *cir.* 1150-60, has seven semi-circular apses at the east end; it was "recently restored"; INKERSLEY, *Inquiry*, 8vo. London, 1850, p. 15, 198; it has a modern Italian façade and a spire added to the tower. The church of Notre Dame de Nantilly is said to date from v or vi cent., but is *cir.* xi cent.; it has a nave and apse and north aisle, the south aisle is xv cent. Notre Dame des Ardilliers has a good dome. The abbey of S. Florent is modern, but in ruins, having been destroyed in the revolution, it was repaired by Napoleon I as a *senatoire*. The hôtel de ville dates in xv and xvi cent.; the courtyard façade was restored and a new edifice added by J. B. de Joly, *cir.* 1830; it contains the museum; GAILHABAUD, *Monuments*, 4to., Paris, 1850, iii, pl. 87-8. The theatre over the market-house dates from before 1841. The public library; communal college; large riding schools in connection with the école de cavalerie for 300 to 400 youths, one of the largest buildings of the kind in France; the house of René, count of Anjou, or maison de la reine Cicile (Sicile), dating before 1456, the façade of which is greatly defaced; CLUTTON, *Domestic Architecture*, fol., London, 1853, p. 41, pl. 10, all deserve notice. The dolmen de Bagneux about two miles distant, is one of the largest and most perfect in France; LA BORDE, *Monuments*, fol., Paris, 1816, i, pl. 4. FOURNEAUX stone. A white stone from Saumur is also used at Nantes. BODIN, *Recherches Hist. sur la ville*, 8vo., Saumur, 1812-14; 2nd edit., 1845. GODARD, *etc.*, *L'Anjou*, 4to., Angers, 1830. 14. 28. 50. 96.

SAUNDERS (GEORGE), F.R.S.; F.S.A. in 1808; was born 1762. He 1780 designed the theatre in New Street, Birmingham, of which the stone façade (sometimes attributed to T. Harrison) only remains after the fire of 1820; the truss of 80 ft. span is shown in TREGGOLD, *Carpentry*, 4to., London, 1828, art. 167, pl. 6; and is described with dimensions in NICHOLSON, *Carp.*, *etc.*, assistant, 4to., London, 1797, 2nd edit., 61, pl. 73. He published *Treatise on Theatres*, 4to., London, 1790, 13 plates, mostly copied from DUMONT, *Salles de Spectacles*, fol., Paris, 1774. 1789 a house for a lady near Windsor. In 1795 he enlarged Caen or Ken Wood, Highgate (by R. Adam), for the earl of Mansfield; 1804 designed the Townley gallery in the British museum, removed about 1851 for the Lycian gallery; PAPWORTH, *Select Views of London*, 8vo., London, 1816, p. 74; published *Observations on Brick Bond as practised at various periods*, 8vo., London, 1805; reprinted in CIVIL ENGINEER, *etc.*, *Journal*, i, 1838, p. 329; wrote 1811 *Observations on the Origin of Gothic Architecture*, printed in ARCHÆOLOGIA, 1814, xvii, p. 1-29; *cir.* 1822 repaired the roof of the Sheldonian theatre at Oxford (ELMES, *Wren and his times*, 8vo., London, 1852, p. 408); and wrote 1833 *The situation and extent of the City of Westminster at various periods*; ARCHÆOLOGIA, 1836, xxvi, 223-41. He was surveyor for the county of Middlesex, writing with PURKIS, *Reports, etc.*, respecting the Bridges, *etc.*, 4to., London, 1826; and was for twenty-eight years chairman of the commission of Sewers for part of Middlesex, *etc.* He reported 15 Oct. 1812 on an "Inquiry into the office of works". A reduced bust in ivory by B. Cheverton after sir F. Chantrey, R.A., is in the collection of the Royal Inst. of British Architects, presented 1846. He died July (?) "1839, in Oxford Street, London, aged 77."

His brother THOMAS, of Upper James Street, Golden Square, died 11 May 1798, by the bursting of a blood-vessel; GENTLEMAN'S MAGAZINE, lxxviii, 448.

SAUNDERS and SANDERS; see CENDRES BLEUES.

SAURA (ANTONIO DE), designed 1620 the chief gate to the town of Palma in Majorca. 66.

SAUROS; see BATRACHOS.

SAUSAGE MARBLE; see CERVÉLAS MARBLE.

SAVAGE (JAMES), born 10 April 1779, at Hackney, was articled to D. Alexander. In 1798 he was admitted a student of the royal academy of arts; 1800 his design for improving the city of Aberdeen obtained the second premium of £150; 1805 obtained a premium for a design for rebuilding Ormond bridge (not re-erected) over the river Liffey, Dublin; and 1808 designed

and carried out 1813-6 Richmond bridge of three arches over the same river—cost £25,800; 1806 read *Essay on Bridge-building* before the London Architectural Society, which was printed in 1808 in the second volume of the *Transactions*; *cir.* 1807 was in partnership with W. H. Ashpitel. The *Observations on the Varieties of Architecture used in the structure of Parish Churches, etc.*, 8vo., London, 1812, may very probably be by him. 1815 designed a stone bridge of three arches over the river Ouse, at Tempsford, Bedfordshire, with the adjacent road and flood bridges; 1820-4 his design for S. Luke's church, Robert street, Chelsea, was selected from above forty; Gothic of xiv and xv cents., with tower 142 ft. high to top of pinnacles, the nave vaulted in solid stone; £20,000, Bath stone, 2,000 persons; BRITTON and PUGIN, *Public Buildings*, 8vo., London, 1825, ii; GENTLEMAN'S MAGAZINE, 1826, pt. 1, p. 201-5; ILLUSTRATED LONDON NEWS, 1843, iii, 117. 1823 his design for London bridge was by one vote rejected for that by John Reanie; he then published *Observations on the proposed new London Bridge*, fol., 1823; designed two bridges on the road made through the Crown lands at Reading, Berkshire; 1827-30 was engaged on behalf of Mr. Peto, builder, in the action consequent on the failure of the foundations of the custom house; with G. Allen designed 1827-9 S. James's church, Spa road, Bermondsey, cost £21,400; LONDON, *Arch. Mag.*, 1836, iii, 498; in 1827-8 he nearly rebuilt S. Mary-at-Hill church, Eastcheap, and much restored the interior in 1848; and the Rectory house. 1828-30 he designed Trinity church, Sloane Street, under £6,000; 1830 Trinity church, Tottenham Green, £5,871; GENTLEMAN'S MAGAZINE, 1831, ci, p. 297; 1830 Bull and Mouth inn, now Queen's hotel, S. Martin's-le-Grand; and the churches of S. Mary, Ilford, and schools; S. Thomas the martyr and schools, Brentwood, Essex; S. Mary, Speedhamland, Newbury, Berkshire; Broxbourne vicarage; Baptist college, Stepney Green; Bromley, Tenterden, Dartford, and other Union workhouses. About 1830 succeeded H. Hakewill as architect to the society of the Middle Temple, and carried out the louvre and north entrance or porch to the hall; 1830-1 designed the clock tower; also Plowden Buildings in Middle Temple lane, and other works; WEALE, *Quarterly Papers on Architecture*, iii. 1832-3 designed S. Michael's church, Burleigh street, Strand, £5,300. 1832 with L. N. Cottingham, published *S. Saviour's church, reasons against pulling down the lady chapel*, 8vo. 1836 published *Observations on Style in Architecture, with suggestions on the best mode of procuring Designs for public buildings, and promoting the improvement of Architecture, etc.*, 8vo. Designed 1836 the new floor and bell frame for the new bell "Great Tom", in the central tower at Lincoln cathedral. 1836 competed for the new houses of parliament. 1836-8 designed S. Paul church, Addlestone, near Chertsey; BRAYLEY, *Surrey*, ii, 230. 1840-2 commenced restoring the Temple church, when upon some disagreement he was superseded for S. Smirke, R.A., and D. Burton, but it was completed mainly according to his original intentions; CIVIL ENGINEER, *etc.*, *Journal*, 1842, v, 392; and repaired the belfry floor and bell frame at S. Mary-le-Bow church, Cheapside, to enable the peal of twelve bells to be rung with safety. Among the houses designed by him is one for — Husband, esq., near the old church at Hampstead; one for sir J. Shaw; for Sam. Cartwright; for R. Vyse at Luton.

He was one of the oldest members of the Surveyors' club; and a member of the Architectural Society (V.P., in 1808, *BUILDER Journal*, 1863, xix, 140). He died 7 May 1852, aged 74, and was buried at S. Luke's church, Chelsea. *Memoir* in the *Sessional Papers*, Royal Inst. of Brit. Architects, read May 31, 1852; in its library are many of his drawings, presented 1854. *Memoir* reprinted in CIVIL ENGINEER, *etc.*, *Journal*, xv, 226. Sale catalogue of books and drawings, 9 December 1853.

SAVELOY MARBLE; see CERVÉLAS MARBLE.

SAVONA (Anc. Sabata or Sabatra). A seaport town in the former duchy of Genoa. The original cathedral, much decorated

by Giulio della Rovere, bishop of Savona and afterwards pope Julius II (1503-13), was razed 1513 for the new citadel. The present cathedral dedicated to the Assumption of the Virgin Mary was erected 1589-1602, and contains the woodwork of the former choir. Near it is a sepulchral chapel founded by pope Sixtus IV (1471-84). There are several good churches and palaces; monasteries and a large hospital. 14. 28. 50. 96.

SAVOT (Louis), physician, born about 1579 at Saulieu, studied antiquities and architecture, and published *L'Architecture Française des bastimens particuliers*, 8vo., Paris, 1624; 2nd edit. with notes by F. Blondel, 8vo., 1685. He was an early improver of the "open fire place", but chiefly in reference to wood fires; *QUARTERLY REVIEW*, December 1854, cxcii, 154.

SAW. A toothed instrument serving to cut solid matters. The best saws made are of tempered steel, ground bright and smooth, and stiff, but bending in a bow; others are of iron hammer-hardened (even in 1675). The manufacture is one of the oldest of Sheffield trades. A particular saw used among the Canadian "lumbering" tools is obtained from Philadelphia because the teeth are less liable to break than the English saws, the saw being thinner.

The edge of the saw in which are the teeth is always thinner than the back, but the teeth are set out that the back may follow the edge. The teeth are cut and sharpened by a triangular file, the blade of the saw being first fixed in a "whetting block". The *straightening of saws* is described in *THE BUILDING WORLD JOURNAL*, 14 May 1877, pp. 56-8. *Saws and Teeth*, in *BUILDING NEWS JOURNAL*, 1867, p. 871. "Saw sharpening machines" are in use. Saws are of various sorts, shapes, and qualities, for the several purposes for which they are intended; as pit, long or whip, framing, bow, hand, plate (see FLAGSTONE), compass, sash, peg-toothed, panel, rib, tenon, dovetail, ripping, keyhole, cross-cut, veneering, fret, band, endless band saw blade, frame, and circular, saw. A "patent combination hand saw" brought out in 1877 comprised the saw, 2-ft. rule, plated square, and a straight edge.

Circular saws revolve constantly in one direction and may be driven with far greater speed than reciprocating saws. They have been very extensively applied to the more delicate kinds of sawing since the beginning of XIX century; it is said they were used for cutting the teeth of watch and clock wheels long before. Brunel in 1806 patented a method of constructing very large circular saws for cutting veneers. 14.

The earliest of the saws for cutting out circular work is said to have been adapted from the trephine saw used in surgery. Harvey's "curvilinear saw" is an adaptation of the "crown" saws by which they may be applied to works of indefinite length. A concave circular saw was invented in 1806.

Before arbitrators appointed 20 April 1812, G. Smart stated "he conceived he had the first circular saw that was made, having purchased it from a Mr. Mainwaring about 1779; he had not used it until he heard of its improvements by general Bentham (particularised in *BUILDER JOURNAL*, 1850, viii, 136; and 1852, x, 247). Prof. WILLIS in his *Lecture on Tools* at the Society of Arts, 28 January 1852, says, "where or by whom the woodcutter's saw was put into the form of a rotating disk has not been recorded". It has been given to the Messrs. Taylor (*BUILDER, ut sup.*). The "circular saw" was only used 1854 in Canada to cut the ends of timbers or a wave. It is now made of all sizes up to 20 ft. in diameter. 32-gauge is used for cutting ivory. In 1877 a patent perforated circular saw was used.

For sawing marble or stone the "plate" saw is used, being without teeth though sometimes slightly notched to retain the sand which with the water trickles down and forms an attrition. HUTCHINSON'S patent, *CIVIL ENGINEER, etc., JOURNAL*, 1844, vii, 37. Instead of the ordinary plate saw, a disc of lead kept well covered with emery, is used in France, with success and economy. In granite work, Mauby and Grissell tried a system of endless wire stretched round two rollers carrying with it sand and water; it answered in every way except commercially.

Zinc can be sawn with the usual small hand saw; and cold iron by a 3½-in. circular saw. *BUILDER JOURNAL*, 1884, xlvii, 951.

SAW BENCH. A machine combining the operations of many others, and is thus called "a general joiner" by some makers. Besides sawing by the circular saw it does planing, tonguing, grooving, rebating, beading, chamfering, boring, and cross cutting, and squaring up. There is also the "improved rack circular saw bench" for round or square timber, and a "double saw bench". *WOODWORKING MACHINERY. TIMBER TRADES' JOURNAL* for 1882. *PENNY CYCLOPEDIA*, 1841, and Supplement. CHASE, *Tools*.

SAW CURF or KERF. The cutting away the joints of stone or brickwork by a saw. In order to straighten a high wall or a chimney stalk, which may lean over, the joints on the opposite side are often thus cut through, the weight above being thus deprived of its support sinks on to the lower mass of the work. Soufflot in 1779 employed workmen to saw-kerf the joints of the piers while building the dome of S. Geneviève, at Paris. HANGING OVER. Wood-bending is often facilitated by saw-kerfing.

SAWDUST. The powder resulting from sawing timber. It is useful for a variety of purposes. In building, it is placed in floors, and in partitions to deaden sound. In stalling, and then as manure; of boxwood for cleaning jewellery; of mahogany for smoking fish; of birch and rosewood by furriers in cleansing furs. Forced into moulds by the aid of heat and great pressure, common sawdust presents a brilliant surface possessing great durability. Numerous fires are occasioned by the careless use of oil dropping among the sawdust and producing spontaneous combustion.

SAW MILL. A building erected for the purpose of converting crude material into articles of commerce, as cutting timber, making mouldings, and joinery works. G. Arcari built 1400 the saw mill, still in use, near the porta Mulina at Mantua. There is one near Augsburg dating 1337; another at Erlanger 1417; island of Madeira 1420; Breslau 1724; Erfurt 1490; in Norway 1530; Holstein soon after 1545; Lyon, at work in 1555; near London 1663 but abandoned; the one near Limehouse 1767 or 1768 pulled down by a mob. Leith in Scotland many years previously. William Penn introduced it into the United States; *MECHANICS' MAGAZINE*, 1823, p. 91, etc. BALE, *Saw Mills, their Arrangement and Management and the Economical Conversion of Timber*, 8vo., 1883. BALE, *Woodworking Machinery; with hints on the Management of Saw Mills*, etc., 8vo., 1882. BALE, *Saw Mills, their Arrangement, etc.*, in *THE TIMBER TRADES' JOURNAL*, February 1882. MOLESWORTH, *Conversion of Wood by Machinery*, in *INST. OF CIVIL ENGINEERS, Proceedings*, xvii, 17-51. WELD, *Travels in America*, 1855; and *BUILDER JOURNAL*, xiii, 248. American Woodworking Machinery; Band saw mills for sawing logs by Fay & Co. of Cincinnati. DEMPSEY, *Saw Mills and machinery for raising Timber in Chatham Dockyard*, in *PAPERS—CORPS OF ROYAL ENGINEERS*, 4to., London, 1843, p. 148.

SAW PIT. In cutting logs into boards or scantlings by hand, it is usual to dig a pit, sometimes lined with timber, across which are fixed two or more beams level with the surface, and on which are placed the logs to be sawn through. One man stands in the pit to assist in working the long saw up and down, while the other or "top-sawyer" directs the saw along the line chalked on the log or timber. Sometimes a framework is made above ground and without a pit, then the logs have to be raised on to it. The "saw bench" with the circular saw and hand saw have nearly superseded this ancient operation. ROBINSON, *The Sawyer's Ready Reckoner*, 8vo., London, 1818.

SAXOINE (GÉRARD DE) was first prior of the abbey of Charité sur Loire founded 1056, and directed the works of the large church of Sta. Croix.

SAXOINE (HENRI DE) is recorded as the rector fabrice and recteur de l'enivre, on a tablet in the church of S. Cyr, the cathedral at Nevers; he erected 1473 the sacristy and a chapel,

and the door fronting the Loire finished 1490. COMITÉ HISTORIQUE DES ARTS, etc., *Bulletins Archéologiques*, 8vo., Paris, 1842-3, ii, 471.

SAXON (SAMUEL) was 1778-91 a pupil of Sir W. Chambers. He designed 1792-3 Northampton infirmary, cost £15,000; 1794 Courteen hall, Northamptonshire, for Sir W. Wake, bart., said to be adapted to the shape of a beautiful knoll (REPTON, *Landscape Gardening*, edit. by LOUDON, 8vo., London, 1846, p. 67); and Buckminster park, Leicestershire, for Sir W. Manners, bart.; both given in RICHARDSON, *Vitruvius Britannicus*, fol., London, 1802, i, pl. 67-73.

SAXON ARCHITECTURE or ANGLO-SAXON STYLE in England, or pre-Norman architecture, prevailed from the end of the sixth to the beginning of the eleventh centuries. LONG AND SHORT WORK. Every characteristic of the style of architecture is shown in a Syriac manuscript written A.D. 586 in the Laurentian library at Florence; LEDWICH, *Observations on our Ancient Churches*, in the *ARCHÆOLOGIA*, 1786, viii, 170. This is referred to in TYRWHITT, *Greek and Gothic*, 8vo., London, 1881, p. 107, 319, 337, 344, as the precious Evangelium MS. of the Syrian monk Rabula; also his *Art Teaching of the Primitive Church*; and ASSEMANNI, *Cat. Bibl. Laurent.*

RICKMAN, *On Saxon Architecture, or such buildings as may be presumed to have been erected in England before the Norman conquest*, Appendix to his *Attempt to Discriminate*, edit. by PARKER, 8vo., Oxford, 1840; and 7th edit., 1881. BLOXAM, *Principles of Eccles. Arch.*, 3 vols., 11 edit., 8vo., London, 1882; and *Mixed Masonry of Brick and Stone*, in *ARCHÆOLOGICAL JOURNAL*, 1845, i, 307-17. WALLER, *Notes on Anglo-Saxon Masonry*, in *BRIT. ARCH. ASSOCIATION JOURNAL*, 1845, i, 117; and *CIVIL ENGINEER, ETC., JOURNAL*, viii, 301. HARTSHORNE, *Some Anomalies observable in the Earlier Styles of English Architecture*, *Builder Journal*, 1847, v, 99-100. POOLE, *History of Eccles. Arch. in England*, 8vo., 1849; and review, *idem*, vii, 110. DUESBURY, *Architecture of Pre-Norman England*; *idem*, 1853, xi, 514; and *Journal of ARCH. ASSOCIATION*, i, 142-59. FREEMAN, *Lecture at Architectural Exhibition*, 18 May 1861. TURNER, *Domestic Architecture*, xii cent. and earlier, 8vo., London, 1851. SCOTT, *Lectures*, 8vo., 1878, ii, 36, 75, etc.

TUTHILL, *History of Arch.*, 8vo., Phil., 1848, relates the destruction of Roman buildings in England by the Saxons. *ECCELSIOLOGIST JOURNAL*, iii, 138-9; iv, 96; ix, 322. CHURCH BUILDER *Journal*, 1868, p. 93, by Scott. ASSOCIATED SOCIETIES, *Reports and Papers*, 1859-60, p. 25; 65: 1863, p. 41: 1875, p. 3; 26. DUBLIN BUILDER *Journal*, 1861, iii, 471. KEMBLE, *Saxons in England*, revised edit. by BIRCH, 8vo., 1876. BROCK, *Saxon Art and Arch.*, in *THE ANTIQUARY JOURNAL*, 1881. NICHOLSON, *Dict. of Architecture*, 1, 17, 19.

Saxon crypts; BUILDER *Journal*, xxi, 542. *Churches*, BUILDER *Journal*, xviii, 125. ASSOCIATED SOCIETIES, *Reports and Papers*, 1874, p. 178. Bradford-on-Avon church, by W. H. Jones, 1876.

SAXON BLUE. A colour made up of indigo with oil of vitriol or spirits of wine. Smalt is also so called. 9.

SAXULPHUS or SAXULF, "abbas et constructor", was nominated first abbot of Medeshamstede (now Peterborough) on the foundation 655 of the monastery, when he immediately commenced the buildings on an extensive scale, until his consecration 674 to the see of Mercia.

SCABBLE; and SCABELLING HAMMER; see SCAPPLE.

SCABELLUM. A species of pedestal anciently used to support busts or small statues. It was high in proportion to its breadth, ending in a kind of sheath, or in the manner of a baluster.

Scabellum and forma; Lat. xv cent. for a form, as scannum was for a bench. A long settle of wood, 1376-7, at which, as is stated, boys might conveniently eat; hence "squab". SURTEES SOCIETY, *Priony of Finchale*, 8vo., Newc., 1837, p. 445.

SCAFFOLD and SCAFFOLDING. Scaffolds 1329. [Fr. *Chaffant*; échafaud (5); in VIOLLET LE DUC, *Dict. escopreche* (5). *Echafauds de masons* of Paris, in DALY, *Revue Générale*, 1842, iii, 145-152,

ARCH. PUR. SOC.

pl. 8); pl. 11 *grue mobile*.] A temporary erection of poles, planks, etc., used in raising walls or executing any work which cannot be otherwise reached. A workman after having raised his wall from the ground level to the height of about 4 ft. 6 in. or 9 in. requires a platform at or near the points reached so as to continue raising his work. This is usually managed by a series of upright poles supporting horizontal timbers (LEDGERS) fixed at about 3 ft. or 4 ft. from the wall, carrying putlogs (putlocks), which latter carry planks for the passage or platform of the workpeople. The poles are usually 20 ft. to 30 ft. or more long, and from 6 in. to 9 in. diam. at the butt end. The putlogs are poles about 6 ft. long and about 4 in. diam., chopped square to prevent them from rolling, the ends being squared to about 2½ in. by 3½ in. in order that they may go into the space of half a brick. Lashings of 1½ in. rope each about 3 fathoms long, with wooden wedges to tighten the lashings are required. The planks of 12 ft. or 14 ft. long and 1½ in. thick, generally hooped at the ends to prevent them splitting, are laid across the putlogs. In high buildings, diagonal poles connect the whole together, and transverse struts are added to prevent the line of scaffolding from separating at top from the wall. In stone-fronted buildings a series of poles are erected at the face of the wall and the ledgers run across the two sets of horizontal poles. PASLEY, *Course of Practical Arch.*, 4to., Lith., 1826; and 8vo., Chatham, 1862. ARCHITECT *Journal*, Jan. 6th, 1872. 1, 14. Rittie's patent scaffold fasteners; BRITISH ARCHITECT *Journal*, Feb. 1882, p. 68. Batt's patented appliances for scaffolding, 1877, by A. Moffatt.

Several examples of raising buildings, taken from illuminated MSS. are stated in GUENEBAULT, *Dict. Iconographique*, 8vo., Paris, 1845, art. "Constructions". In 1365-6 are mentioned scaffold logs, crates or hurdles to make the scaffolds, thongs, warroks (?), spykyngs; BRITTON, *Palace of Weston*, 8vo., London, 1836, p. 190. 1401, scaffaltes, seyntrees, and flekes, occur in the contract for building the monks' dormitory at Durham. In many Roman works the putlog holes still disfigure the remains. VIOLLET LE DUC, *Dict.*, illustrates the mediæval mode of building.

A scaffold of wickerwork was erected 1776 by T. Birch for £20 around the spire of Islington church, London, within which was a spiral staircase from the tower to the vane. Alderman Sir W. Staines is said to have contrived such a scaffold to the spire of S. Bride's church, Fleet Street, damaged by lightning in 1764 (*EUROPEAN MAG.*, lii, 338). Improved by Birch in repairing the steeple at S. Alban's, he perfected it at Islington; NELSON, *Hist. of Islington*, 4to., Lond., 1811, p. 312. HURDLES.

In France a scaffold is not much used, the work is done overhand from the inside; the materials are raised by sheer legs or guys, as is the usage at Manchester and the north of England. The method of tiling a house at Maçon by ladder work employing 23 men, is narrated by R. R. Rowe, in BEAUMONT, *Tour in France*, 8vo., Newton, 1860, p. 107. Overhand building is usual in Belgium; BUILDER *Journal*, 1860, xviii, 253.

To assist in the prevention of accidents in connection with scaffolding it has been proposed that rope nets of a 3 in. mesh and strong enough to resist the pressure of men or materials, in 24 ft. lengths by 6 ft. width, having rings attached to them through which a rope should pass to attach the net to the scaffold poles, and so form a gallery where work may be going on; with other suggestions; BUILDER *Journal*, 1856, xiv, 642.

At large works a framework called "FRENCH (or Jenny) SCAFFOLD" is formed independent of the building, of vertical and horizontal timbers used whole, braced together diagonally, carrying on the top a rail, on which a windlass moves for raising or lowering materials. Buckwell's patent scaffold, BUILDER *Journal*, 1843, i, 532; 565. Framing and travellers at Perth bridge; HANN AND HOSKING, *Bridges*, 4 vols., 8vo., London, 1843-50. GRISSELL, *On Timber Scaffolding for Buildings*, INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1844; and BUILDER *Journal*, 1845, iii, 33-4. A central stage with steam crane on the top of it is now extensively used.

N. Barattiero, *cir.* 1178, constructed a scaffolding which could be raised or lowered as necessary, in the repair of the Campanile in the piazza at Venice. It is said to be shown in a very old print. The "suspended" scaffold or gangway is described as used 1861; BUILDER *Journal*, xix, 437. The knotted rope is also described, as well as the use of the "hooks" seen in high pitched roofs. Improved swing scaffold 1874 from the roof or windows. Suspended scaffold; KRAFFT, *Charpenterie*, fol., Paris, 1805, pt. 2, pl. 73. French system for Painting; CIVIL ENGINEER, *ETC.*, *Journal*, xvi, 432. Patent suspended scaffold; PARTINGTON, *Builder's Complete Guide*, 8vo., London, 1825, p. 380.

Flying scaffold, 1721, at Blois, by PIRROT, *Recueil de dif. projets d'Arch.*, de Charpente, fol., Paris, 1756, pl. 13. Reeve's adjustable scaffold, SOCIETY OF ARTS, *Transactions*, 1839-40, pt. LIII, p. 102. Hughes's revolving scaffold for repairing domes, *idem*; and PARTINGTON, *ut sup.*, p. 380-1; and a Scaffold crane, 1858. Ell's Adjustable Scaffold, or fire escape, *etc.*, BUILDER *Journal*, 1844, iv, 583. Thomas's scaffold for decorations, working on castors; *idem*, 1860, xviii, 679. Rolling scaffold for Bordeaux railway; ANNALES DE LA CONSTRUCTION, fol., Paris, 1857, iii, pl. 55-6; and Bielefeld's portable scaffold, C. E., *ETC.*, *Journal*, 1838, i, 46. A Scaffold for tall chimneys; *idem*, viii, 110. Screw scaffolding, BUILDING NEWS *Journal*, 1879, xxxvi, 581 and plate.

General works. MOXON, *Mechanick Exercises* (Bricklayer), 4to., London, 1700, p. 11. LEUFOLD, *Theatrum Machinarum*, fol., Leipzig, 1725. ROMBERG, *Zimmerwerks baukunst*, fol., Leip., 1846-50, p. 140-50. MALPAS, in BUILDER'S POCKET-BOOK OF REFERENCE.

Special examples. New Houses of Parliament, Westminster. The circular or revolving scaffold; BUILDER *Journal*, 1845, iii, 41. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, by C. BARRY, 1856-7, p. 156. BUILDER *Journal*, 1857, xv, 490. DALY, *Revue Générale*, 1857, xv, 129-203; 205, *etc.* INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, iii, 203, 216-8, 223. Victoria Tower; ILLUSTR. LONDON NEWS, 1850, xvi, 68.

Sta. Maria Fiore at Florence, by Brunellesco; Rosso, *La Metrop. Fiorentina*, 4to., Flor., 1820, pl. viii. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1883-4, p. 160 and plate.

Milan cathedral, FRANCHETTI, pl. 7 and 8.

Monument by Sir C. Wren, CIVIL ENGINEER, *ETC.*, *Journal*, i, 267.

Nelson's column; *idem*, 1843, vi, 409; BUILDER *Journal*, 1842, i, 522.

Column at Devonport; BUILDER *Journal*, 1845, iii, 33.

Königsbau, Munich; ALLGEMEINE BAUZEITUNG, 1837, pl. 101.

The Louvre, Paris; SYLVESTRE, *Vues du Louvre*.

S. Peter's, for painting the sides and ceiling, and for raising the obelisk; ZABAGLIA, *Contignazioni, etc.*, fol., Rome, 1743.

For a spire; DUNCOMB, *Herefordshire*, 1804-12, i, 599. At the church of S. Sepulchre, London, to prevent the necessity for erecting scaffolds for repairs a simple framework of timber has been constructed which extends over the centre aisle, and is supported on either side by the cornice, along which it may be drawn to any required situation. When not in use it remains over the organ. A process by which merely one stage of scaffolding was used in building a tower is described by J. J. Lish in BUILDING NEWS *Journal*, 1879, xxxvi, 463.

SCAFFOLD. An old term 1638 for a gallery, as in a church.

SCAFFOLD BOARD. Across the putlogs are placed boards on which workmen stand. They are usually 1½ in. deals, the ends being sometimes somewhat rounded and bound at the edge with iron hooping to prevent injury by wear.

SCAFFOLD POLE. The article in BUILDING NEWS *Journal*, 1869, xvi, 237, gives the calculations for safety. Batt's patented appliances for scaffolding 1877 are said to effect great saving in labour and materials combined with increased strength. ALNUS FIREPOLE.

SCAGLIOLA. Said to be derived from It. *scaglia*, scale or shell. Itali, quasi dicant squamedam, *etc.*, PHILANDER's note on *Vitruvius*, vii, 3; s. v. Gypsum. Also called *Mischia* in Italy. A few writers have confounded this work with the opera di COMMESSO, or FLORENTINE MOSAIC. The purest gypsum is first broken into small pieces, and after being calcined is reduced to

powder or plaster-of-Paris. It is then passed through a fine sieve and mixed with Flanders glue, isinglass, *etc.*; in this state it is mixed up with colouring matter of the hue required. It is generally employed for the imitation of veined marble the different shades being mixed up separately. Thus prepared it is applied to the intended surface. The next operation is smoothing and giving it a fine polish. A durable lustre may be thus obtained equal to the finest and most highly polished marble. It is considered to become as hard as the hardest marble. Very fine crystals of selenite, sometimes of a large size, are not unfrequently found in the fissures of the gypsum, in the mines of Castellina; they are used in making the fine cement for scagliola, and therefore are sold at a higher price than the ordinary gypsum; HAMILTON, *Geology of Tuscany*, in *Quarterly Journal* of the GEOGRAPHICAL SOCIETY; and CIVIL ENGINEER, *ETC.*, *Journal*, 1845, viii, 287. Close contiguity to jets of gas is said to discolour it.

The earliest work in scagliola, dated 15 June 1615, was by G. Fassi, whose claims to the invention are acknowledged, and whose chief works therein are mentioned by TIRABOSCHI, *Notizie*, 4to., Modena, 1786, p. 184, citing MAGGI, *Memoire*, p. 186; and by LANZI. The earliest use of it in England is said to have been at the Pantheon in Oxford Street, by James Wyatt, opened 22 Jan. 1772. It was introduced at Stowe, in Buckinghamshire, in sixteen Sicilian jasper columns executed about 1775, by Domenico Bartoli; in the imperial library at Vienna by J. B. Fischers; and extensively in the palace of the Grand duke Michael, at S. Petersburg, as related by GRANVILLE, *St. Petersburg*, 8vo., London, 1835, i, 548-52. It is mentioned for inlaying as superior to marble, by RICHARDSON, *Chimney Pieces*, fol., London, 1781, p. 7. Coade's gallery of artificial stone ornaments, *etc.*, described in PYNE, *Somerset House Gazette*, 20 March 1824, p. 381-2. *Practical remarks on S.*; BUILDER *Journal*, 1845, iii, 20; 50. 1863, xxi, 839-40, giving examples of its use in buildings in England. 1. 2. 14.

SCALA GLADOVA. A town in the province of Servia. About 2½ miles below it are the remains of the bridge built by the emperor Trajan over the river Danube. SMITH, *Geography*, s. v. Dacia, 744.

SCALA (GIOVANNI BATTISTA DALLA), also a sculptor, designed 1631-2 the triumphal arch at Padua. ROSETTI, *Descr. di Padova*, 12mo., Padua, 1780, p. 302.

SCALE, or leaves, are shown to some columns of the temple to Jupiter Clitumnus, near Foligno. PALLADIO, *Archit.*; EUSTACE, *Tour*.

SCALE. A line divided into a certain number of equal parts, each of which is sub-divided into others, in order to express the portions of an object of a different size either in a drawing or in a model, but at the same time kept in the same proportion as the original.

The Plane scale, diagonal scale, Gunter's scale, and plotting scale, are the chief ones used. RULE. HOLTZAPFEL, *Scale of equal Parts*, 8vo., London, 1838, reviewed in CIVIL ENGINEER, *ETC.*, *Journal*, i, 186.

SCALE PAPER. Paper having printed upon it divisions in eighths, tenths, *etc.*, of an inch for drawing in proportion. A similar paper, but ruled in red chalk, was used by Bramante Lazzari in designing, as shown in GEYMULLER, *Projets pour la basilique de S. Pierre*, 4to. and fol., Paris, 1875-80. The system is also shown in some plates in SCAMOZZI, *Dell' Idea della Arch. Universale*, fol., Ven., 1615, p. 260-1.

SCALE WORK. A minute early ornamentation in stone as a decoration. The *Glossary of Architecture*, pl. 71, gives S. Margaret at Cliffe, near Dover, *cir.* 1130; at Old Sarum, pl. 113; Peterborough, cloisters, pl. 116; Hadiscoe, pl. 117; S. Etienne at Caen, pl. 139. 17.

SCALFUROTTTO (GIOVANNI), or Scalfarotto, of Venice, restored 1718-38 the church of S. Simone minore; CICOGNARA, *Venezia*, fol., Ven., 1838-40, ii, 75, pl. 3. He also restored the scuola di S. Rocco (*cir.* 1495 by B. Buono and completed by S.

Lombardo and A. Scarpagnino). He died 10 October 1764. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 460. 3. 68.

SCALLAGE or SCALLENGE. A term used in Herefordshire and the west of England for a Lychgate.

SCALLOP WORK. Work cut so as to look like shells laid side by side and over and under. It occurs on the roof of the lantern and pinnacles at old cathedral at Salamanca; and at Zamora; STREET, *Gothic Arch. in Spain*, 8vo., London, 1865, p. 81; 83; 94 and cut. It is also to be seen at Caistor church, Northamptonshire. *The Symbolism of the Scallop shell*, by H. C. COOTE, in the *ARCHÆOLOGIA*, 1869, xlii, 322. 19.

SCALPED WORK; see SCAPPLE.

SCALPTURATUM; OPUS. PLINY notices that it resembled inlaid work; a pattern being chiselled out in the solid ground, and filled up with thin leaves of coloured marble. One of the most curious and beautiful is given in POMPEII, 1832, i, 245-6; ii, 26; 39 states "this sort of pavement was first introduced into Italy, in the temple of Jupiter Capitolinus, after the beginning of the third Punic war, B.C. 147-103. But ere the Cimbric wars began such pavements were in common use at Rome, and men took great delight and pleasure therein."

SCALZA (IPPOLITO and FRANCESCO), of Orvieto, were employed at the duomo; the former (a pupil of Buonarroti) 1580, to whom the pulpit *cir.* 1579 is attributed, and all the palaces of the period; and the latter 1619 after the death of his brother. DELLA VALLE, *Duomo*, 4to., Rome, 1791, index, p. 380.

SCAMILLI IMPARES. A term used by VITRUVIUS, the exact meaning of which was first elucidated by John Penne-thorne, but appeared first in a Vienna journal about 1841. *The curved lines of the Parthenon* were investigated by F. C. Penrose (*Builder Journal*, 1846, iv, 122), and the result showed that the term referred to certain small allowances made in the rise of a straight line to make it appear level. OPTICAL CORRECTION. HOG-BACKED. ATHENS (p. 117). ASKEATON. RONDELET, *Etude sur la question relative aux Scamilli impares*, 4to., Paris, 1860. DALY, *Revue Générale*, 1875, xxxii, 153.

J. P. W. in *Builder Journal*, iv, 151-2, suggests that the *scamilli impares* were members of the stylobate between their coronæ and the undersides of the plinth, required to correct the want of parallelism between the oblique lines of the bases and the horizontal ones of the stylobate, caused by the axes of the angle columns not being set perpendicular but inclined inwards. The base of the order at the temple of Rome and Augustus at Pola, is raised five parts above the stylobate and the pilaster four parts; STUART, *Athens*, vol. iv by Woods, fol., London, 1816. The lowest member of the base of the columns on the exterior of the Bank of England, by Sir John Soane, is detached from the plinth, probably to keep them level, as at the same time the top of the plinth is inclined outwards to throw off the water. These arrangements are similar to those shown in VITRUVIUS, edit. by MARINI, fol., Rome, 1837, pl. 30-1, as interpreting the passage in the text. BALBUS, *S. I. Vitruviani*, 4to., 1612. MEISTER, *De Optica Veterum Ars*, in *Novis Comm. Soc. Reg. Scient. Gotting.*, v and vi. TEMANZA, *Degli S. I. di Vit.*, 8vo., 1780. 1. 2. 17.

SCAMOZZI (GIOVAN DOMENICO), planned cities and territories; was well versed in architecture; modernised the palace called Castello reale at Warsaw (CIAMPI, *Viaggio*, p. 150, 36; *Notizie*, 1830, p. 93); superintended various buildings in and around his native city of Vicenza; and made an index to *Tutti l'opera d'Arch. di Seb. Serbio*, 4to., 1584, though it appears to have been by his more celebrated son; and wrote *Discorso intorno alle parti dell' Arch.*, 4to., 1619. 68.

SCAMOZZI (VINCENTO), born 1552 at Vicenza, a pupil of his father above mentioned, went to Venice to study the works of Sansovino and Palladio; composed 1574 a treatise, not published, on perspective for theatres and scenes; 1574 designed a country house for the conte Leonardo Verlati, at Villa verla (s. 285); formed a lantern in the cupola of the church of S. Salvatore; and 1576, designed a square casino with rotondo for

Vittor Pisani alla Rocca, near Lugano, given in the 1615 edition of his work (s. p. 272).

In 1579 he went to Rome to study mathematics under fra Clovio, and made drawings of the ruins and published *Discorsi sopra l'Antichità di Roma*, 11 or 40 pl. by Pittoni, fol., Ven., 1582; thence went to Naples; and returning to Venice, where 1583 he settled; completed the tomb to the doge Niccolò da Ponte (died 1584) in the church of Sta. Maria della Carità, now destroyed. He continued 1582 the libreria vecchia, commenced 1536 by J. (Tatti) Sansovino, adding the public museum or antisala della libreria; also 1584 carried on the procuratie nuove on the south side of the piazza by adding a third order for a second story to Sansovino's design, and extending it to the side of the then existing church of S. Geniniano; it was completed by B. Longhena; CARLEVARI, pl. 45; CROGNARA. In the doge's palace he designed, probably after the death 1597 of A. da Ponte, the camino nell' anticollegio, porta dell' anticollegio, and porta del magistrato all' armar ora gran guardia; also 1591 the cross church of S. Nicola de' Tolentini, a good work (the façade was continued and altered by A. Tirali after his death).

He then visited Rome with the ambassadors to congratulate pope Sixtus V on his exaltation 1585; then to Vicenza to direct the festivals on the passage of the empress Maria of Austria. For Vespasiano Gonzaga, duca di Sabionetta, he erected a theatre after the manner of the antique which was much approved; designed 1588 a palazzo at Peraga, near Padua, for P. and M. Badoeri (s. 290); 1588 palazzo at Poisuolo near Castel Franco (s. 294); and a palace with angular bastions for Christoforo, duca di Sarras, in Poland (s. 252); 1590 palazzo for Hiero. Contarini at Oregiola, near Campo S. Piero (s. 289); 1592 the palazzo for Francesco Tressini, later conte Ottavio Trento, near the cathedral, at Vicenza (s. 258); and 1592 on the corso, another palazzo for Marco Antonio Tressino, completed 1662 under O. Calderari; laid 1593 the first stone of the famous fortress at Palma, near Friuli; 1594 casa (square with rotondo) at Monfumo, monte d'Asolo, for Val. Bardinelli (s. 278); 1594 the church (or façade only) of S. Gaetano of the Theatins; ROSETTI, *Descr. di Padova*, 12mo., Padua, 1780, p. 173; and LALANDE, *Voy. en Italie*, 12mo., Ven., 1769, viii, 275; and 1597 palazzo (square saloon) near Padua for N. Molino (s. 274).

About this time, contemplating writing a history of architecture, he in 1600 accompanied the ambassadors into France, Lorraine, Germany, and Hungary, returning to Venice. He then designed a palazzo for cardinal Federigo Cornaro a S. Maurizio on the grand canal (s. 244; CARLEVARI, pl. 65), but the existing one is by Sansovino continued by Longhena; the palazzo Contarini a S. Trovaso (degli Scrigini), CARLEVARI, pl. 85; tomb of the doge Grimani (died 1605) in the church of S. Giuseppe di Castello; Ospedale di S. Lazzaro die Mendicanti; 1607 a casino, at Paradiso, Murano, for N. Cornaro (s. 280); and 1608 a country house on La Renta, near Castel franco (s. 276); and 1609 palazzo at San Doria di Piave for conte Dom. Trevisano (s. 292). At Florence he 1602 or 1605 added the second floor to Buontalenti's palazzo Roberto-Strozzi completed by G. Caccini (s. 247; FAMIN, *Arch. Toscane*, pl. 58-9; RUGGERI gives details ii, 17-22); 1604 designed for the prince bishop of Salzburg, the cathedral carried out 1614-18 by S. Solari. At Genoa, the palazzo Ravaschiera of three floors in piazza di S. Lorenzo, called Negroni in 1788 (s. 264); at Alpiero, a palazzo for conte da Schio; 1611 at Bergamo, a palace for Giulio Contarini (s. 262); and at Prague a Doric portico, portico or large portal, and the wing extending from the royal rooms of the Königliche schloss to the Spanischensaal (26).

He published *Dell' Idea della Architettura universale*, 2 vols., fol., Ven., 1615, being six books out of twelve. It was translated by D'AVILER, Paris, 1685; and La Hague, 1736; added to by DU RUY, 1713; 1764; by TICOZZI AND MASIERI, 8vo., and 4to., Milan, 1838; Nuremberg, fol., 1697. LEYBOURNE, *The Mirror of Architecture*, etc., 4to., London, 1700. *Elementi*, by BERTI, fol., Ven., 1811. This work is one of the four chief Italian authori-

ties; the orders are considered very good, and are compared with others in MILIZIA, *Lives of Architects* (PALLADIO, p. 24A). He died 7 August (?) 1616, and was buried in the church of S. Giovanni e S. Paolo, at Venice; a memorial was put up in the church of S. Lorenzo, at Vicenza; in the museum of that town are many of his drawings. B Longhena is considered to have been a pupil. The palazzo publico at Verona attributed to him is by A. Midano; at Venice, the ponte Rialto is by A. da Ponte, 1588-90; MAGRINI, *Ponte*, 8vo., Vic., 1854; the palazzo Grimani is by San Michele; and the palazzo Corner Mocenigo has also been attributed to him.

Il Forestiere—di Arch.—di Vicenza, 8vo., Vic., 1804, with plates. CARLEVARII, *Fab. di Venezia*, fol., Ven., 1703. CICOGNARA, *Fabbriche*, fol., Ven., 1838-40. SCOLARI, *Della Vita e delle opere di V. S.*, 8vo., Treviso, 1837. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 341-53. TEMANZA, *Vita di V. S.*, 4to., Ven., 1770. QUATREMÈRE DE QUINCY, *Vies*, 8vo., Paris, 1830, ii. 1. 3. 12. 14. 25. 26. 34. 68. 83-110.

Scamozzi was the inventor of the two-foot joint rule. COGGESHALL, *The Art of Practical Measuring, easily performed by a two-foot rule—the use of Scamozzi's lines, etc.*, 12mo., 1729.

SCAMOZZI (BERTOTTI); see SCAMOZZI (OTTAVIO).

SCAMOZZI (maestro GIOVANNI), of Vicenza, 1546 presented with A. Palladio a design for improving the town hall. ARNALDI, *delle Basiliche Antiche*, 4to., Vic., 1769, xli.

SCANDULE. The Latin term for shingles or flat pieces of wood used instead of tiles. According to CORNELIUS NEPOS this was the only covering used in Rome till the war with Pyrrhus in the 470th year of the city. The *scandularii* or house coverers were exempted from all public services. 1.

SCANSORIUM (Gr. *αοβαλίων*). The Latin term for scaffolding; VITRUVIUS, x, 1.

SCANTLE. A gauge for regulating the proper length of slates. "Scantle slates" are squared slates as opposed to rag slates.

SCANTLING (Fr. *eschantillon*). The carpenter's term for the transverse dimensions of stuff. The dimensions of a piece of timber in breadth and thickness. Also of a piece of timber, as a quarter, or stud of a partition, when under 5 in. square. In masonry, it is the length, breadth, and thickness of a stone. Tables of *Scantlings of Timbers*, from after the great fire of London, are given in NOBLE, *Professional Practice*, 8vo., London, 1836, p. 111-5. 1. 14.

SCAPE (Lat. *scapus*, Fr. *escape*, Ger. *hohl leiste*?). The term used for the apothesis, apophyse and apophysis, being the curve or hollow connecting the shaft of a column with its cap and base VITRUVIUS, iv, 1 and 7. ESCAPE.

SCAPPLE (from Lat. *scalpo*, to carve), scaple, scapple, scabble, skable, skiffle; "Scapelled", as in Report 1808 on Henry VII's chapel, in *BUILDER Journal*, xx, 43; "Scappelled", in SMEATON, *Eddystone Lighthouse*, fol., p. 62. Stone shaped at the quarry with a heavy hammer. Rough punched; nobbled, hammer dressed, are other terms for such work, the first operation on rough stone by the scappling hammer. ASHLER. BROCHED. GRANITE (p. 72, 74). FACED WORK. KENTISH RAG.

Scabble, scabbling, scabbled, dim. of scrape; as in 1 Samuel, xxi, 13; BOOKER, *Obsolete Words*, 8vo., Dublin, 1853.

Scapulationem, or sapulacionem, or stapulationem; 4 Edward III, SMITH, *Antiq. of Westminster*, 4to., London, 1807, p. 182; and 21 Edward III, in BRITTON, *Palace of Westminster*, 8vo., London, 1836, p. 164, where it seems to imply boasting before carving.

Scapulus, scapulus, scorpilys; *York Fabric Rolls*, 1399, etc., p. 352. Scapulatione et wayning petrarum; *Lavatory Roll at Durham*, 1432. Hewyng, brochyn and scaplyn stone; *Durham Castle Roll*, 1543.

SCABBLING HAMMER; see CAVIL, properly GAVIL or GAVEL; and KEVEL. The JEDDING AXE or stone hammer. It is used to bring stone nearly to shape. 1.

Cabbling or scabbling in iron manufacture, is the breaking up

of the beaten iron after smelting with charcoal, which is then heated and hammered and drawn out into bar iron.

SCAPUS. The Greek term for the shaft of a column. 1. SCARBOROUGH (JOHN), 1696 was clerk of the works at Greenwich hospital under Sir C. Wren.

SCARCEMENT or SCARSEMENT. A Scotch term for a set-off or set back. 17. 23.

SCARF or SCARFING (Fr. *enter, assemblage*), perhaps from the Anglo-Saxon *carf*, cut. An indented joint in timber to connect two pieces of timber longitudinally to obtain the requisite length. The strongest and best method is the zig-zag wedged in the middle, as shown in works on Carpentry. FISHED BEAM. Large timbers are also bolted or strapped together. LANGLEY, *Builder's Assistant*, 8vo., London, 1738, pl. 50. ARCHITECT *Journal*, 1849, i, 139, 155, 285, 315; 386 Vertical. MAHAN, *Civil Engineering*, 4to., Edinb., 1845, p. 62. ROMBERG, *Zimmer Werks baukunst*, 4to., Leipzig, 1846-50, pl. 32 and 53. CHRISTY, *Treatise on Joists used by Builders*, 12mo., London, 1882. ROBERTS, *Mode of Scarfing*, 8vo., 1852. 1. 14.

SCARLET; see IODINE SCARLET.

SCARLET LAKE is prepared in form of drops from cochineal. It is a beautiful transparent red colour and excellent body, working well both in oil and water. Strong light destroys it. LAC LAKE. 9.

SCARLET OCHRE. Green vitriol calcined; Prussian red, or English red, or Venetian red, prepared from sulphate of iron, or its residuum in the manufacturing of acids. They are redder and deeper hues than light red, and are very permanent. 9.

SCAROLA (FRANCESCO), restored 1773 the theatre De' Fiorentini, at Naples. SIGISMONDO, *Descr.*, 8vo., Naples, 1788, ii, 270.

SCARPAGNI (ANTONIO), dello Lo Scarpagnino, of Venice, was one of the many who 1514 submitted designs for rebuilding the bridge of the Rialto; MAGRINI, *Ponte*, 8vo., Vicenza, 1854, p. 9 (erected 1588-91 by his pupil A. dal PONTE de Conte or Contino); designed 1523 the church of S. Giovanni Elemosinario; that of S. Sebastiano (the interior by S. Serlio and the façade by Tatti Sansovino); the confraternità or scuola di S. Rocco, succeeding 1527 S. Lombardo; completed *cir.* 1537 the façade in the piazza of the doge's palace; 1547 the porta dell' Albergo (ii, 63) and the portone di legno in the facciata alle Prigioni, with Ant. Bregno (i, 66); 1545-50 the grand cortile and scala dei giganti with Ant. Bregno, il Riccio (CICOGNARA, *Venezia*, fol., Ven., 1838-40, i, 64); and the fabbriche Vecchie a Rivalto (i, 97). He died about 1558. ALLGEMEINE BAUZEITUNG, 1849, text, 79. SELVATICO, *Arch. in Venezia*, 8vo., Ven., 1847, p. 184; 208-11.

He is supposed to be the same as Alessio ARIENSE of Bergamo or Bologna; and also as Alessio Aleardi, employed June 27, 1490, to report on the works of the cupola of the duomo at Milan; and was engaged from 1488 on the deepening of the river Brenta (or the Brentone canal or canale della Brenta, at Venice) down to about 1507 (GIOCONDO); MARCHESE, *Lives*, etc., 8vo., Dublin, 1852, ii, 156; 162. 68.

SCARSELLA or SCARCELLA (SIGISMONDO) called Mondino, of Ferrara; also a painter and designer, practised at Venice and Trevigi. He died 1614. His son Ippolito, called Scarsellino, died 1620, was chiefly a painter. SUPERBI, *Uomini illus. di Ferrara*, 4to., 1820, fol. 127. MASINI, *Bologna perustrata*, 4to., Bol. 1666, fol. 630. 5. 30. 68.

SCAVENING. The cleansing of streets and roads. An apparatus or "destructor", was erected by Manlove, Elliot, & Co., at Manchester and Leeds, about 1879 for burning up such refuse. The slag which collects in the furnaces is ground by mills into a fine sand and used in making mortar. Any pots and ironwork are collected and sold. A "refuse or dust destructor" at Burnley is described as a domed receptacle 7 ft. diam., for use in a town of 60,000 inhabitants; destroys a load or 15 cwt. of refuse in an hour at a cost of 1s. for fuel and attendant; *BUILDER Journal*, 1884, xlv, 912. Other apparatus are in use at Richmond, Yorkshire; Leicester; Birkenhead; Batley; Bradford; Worcester; Bournemouth; and by the corporation of the city of London at

Lett's wharf, Commercial Road, Lambeth. Rotary brushes, set in motion upon the road surface, by a horse drawing them, are used in many towns with economy and efficiency.

SCENA or SCENE. An alley or rural portico for shade or shelter wherein, according to CASSIODORUS, theatrical pieces were first represented. When first applied to a theatre it signified the wall forming the back of the stage, or the permanent architectural front which faced the audience in ancient theatres. (THEATRE.) It afterwards came to mean the whole stage. It is now restricted to the representation of the place in which the drama represents the action. The ancients had three kinds of scenes, the tragic, the comic, and the satyric. The Greek tragic scene was usually of two stories and had a door in the middle of it, called the royal door, with small doors at the sides or wings called *hospitalia*, representing the entrances to habitations destined for strangers. There were five doors in the scena of some theatres; one scena being not less than 250 ft. long. *Pompeii*, by Society for the Diffusion of Useful Knowledge, 8vo., London, 1831, i, 238, 265. The Roman scene sometimes consisted of three several ranges of columns one above another. DONALDSON, *Form, Arrangement and Construction of the Greek Theatre*, in STUART & REVETT, *Antiq. of Athens*, fol., London, 1830, iv. VITRUVIUS, v, chap. 3-9. Remains of the scena exist at the odeum of Regilla or Herodes Atticus, at Athens (Schillbach, *das Odeion*, 1858; Breton, *Athènes*, 1868; and Genelli, *das Theater*, 1818); at Orange, and Arles (Caristie, 1839); Taormina, very perfect (Serradifallo, *Antichità*); Pompeii (Mazois); Aspendus, almost perfect (Texier, *Asie mineure*, 1839-49); Aizani (Lebas and Waddington, *Voyage*); Patara, very perfect (Society of Dilettanti, 1797). Orange and Aspendus are specially referred to in LÖHDE, *Die Scene der Alten*, 4to., Berl., 1860. For these and other works refer to the articles, and to THEATRE. A. Palladio and V. Scamozzi each designed and erected a theatre after the ancient model, with scena, etc., complete. 1. 25. 78.

SCENE PAINTING. This art must have been applied long before the time of Sophocles, to whom it has been attributed. VITRUVIUS in the proem to his seventh book, quotes Agatharcus, Democritus, and Anaxagoras, as having left complete treatises on the art. The scenes painted by Baldassare Peruzzi, about the time of Pope Leo X (1513-22), are said to have brought scene painting to great perfection. SERLIO, *Architettura*, fol., Rome, cir. 1540-51, showed the rules for painting scenes. Inigo Jones made designs for the masques of the time of king James I. The following* have also published works on the subject:—

*Pozzo, 1693-1702	*Gonzago	*Vaccani, 1832
*Galli detto Il Bibiena	*Quaglio, 1823	J. Grieve
*Servandoni	*San Quirico at Naples	G. Stanfield, R.A.
De Louthembourg	*Gropius	D. Roberts, R.A.
*Lambert, cir. 1760	*Fontanesi, 1813	T. Grieve
Rooker	*Galliani	Beverley
Novosielsky	*Schinkel, cir. 1810	Calcott
Capon	*Santi, cir. 1700	Fenton

GODWIN, *Sketch of the History of Scene Painting*, in BUILDER *Journal*, 1859, xvii, 353. A collection of designs for scenes was exhibited at Paris 1878 in the Exposition Universelle. LANDRIANI, *Osservazione*, 4to., Milan, 1815, and *Aggiunta*, 1818, give rules for scenic delineation.

SCENOGRAPHIA, or scenographic projection. The method of representing solids in perspective.

SCEUPHYLACIUM. The receptacle for the sacred vessels, etc., in the SACRISTY; see DIACONICUM; and EVANGELIUM.

SCEUS, or SCEVUS, is said to have made one of the gates of Troy, to which his name was given. 5. 29.

SCHÄAL (FRANÇOIS), pupil of A. Leclère of Paris, erected at Odessa the quarantine, lycée Richelieu, imperial bank, and several houses; also the lazaretto and the new city of Kertch, in the Crimea. DUSSIEUX, *Art. Franç.*, 8vo., Paris, 1851. *Annuaire statistique des Artistes Français*, 1836, Comm. by Jacot.

SCHÄAL (.....), designed 1844 a house at Auxerre, given in NORMAND, *Paris Moderne*, 4to., Paris, 1849, iii, pl. 55-9. This is probably the JACQUES LOUIS born 1799. 68.

ARCH. PUB. SOC.

SCHABELLUM; see SCABELLUM.

SCHADDE (JOHANN DANIEL), born 1730 at Novgorod, studied in Dresden; 1755 was hof-bau-conducteur; and carried out among many important buildings the edifice in graf Marcolini's garden in Friedrichstadt, with the pavilion in the English garden. He died 1798. 68.

SCHADDE (JOSEPH), designed 1853 at Antwerp the large building, 105 ft. long and 60 ft. high, for the association called *Cercle Artistique*.

SCHADOW (FRIEDRICH GOTTLIEB) was born 1761 at Berlin, where he studied; held appointments 1794 and 1805 at Potsdam; 1819 became member of the academies at S. Petersburg, and of Berlin, where he died 1831. 68.

SCHADOW (ALBERT DIETRICH) studied under K. von Schinkel, went to Italy, and on his return was appointed hof-bau-conducteur at Potsdam; schlossbau-meister at Berlin, and 1843 baurath; 1841 enlarged and modernised the country house of prince Leignitz; and made numerous designs, many of which appeared in the *Architektonische Album*. He was assisted by Stüler. 68.

SCHAFFHAUSEN. A town in Switzerland, situated on the river Rhine, here crossed by a common timber bridge, the successor to the celebrated one erected 1770-1 by GRUBENMANN; (JETZELER) and destroyed 1799. The walls have turreted gateways; the feudal castle called Munoth (? Munitio) is said to be of Roman construction with walls 18 ft. thick provided with bomb-proof casemates; a wide spiral passage up the interior of the tower for horse or carriage. The houses are old, many having carved and plastered fronts with oriels; the halls of the ancient guilds have quaint ornaments. The cathedral or münster, dedicated to All Saints, founded 1052-1100 is unaltered; the tall tower contains a bell 18 ft. in circumference. The parish, or S. John's, church is very large, with a tall tower. The town house was built 1412. PROUT, *Sketches in France, etc.*, fol., London, 1839. 14. 28. 50. 96.

SCHAN (MARC), architect at the cathedral of Strasbourg, presided at a meeting of masons' lodges held 29 September 1563. GRANDIDIER, *Essais Hist.*, 8vo., Stras., 1782, p. 424.

SCHÄSSBURG. A royal free town of Transylvania, in Austria, situated on the Great Kokel, crossed by a covered bridge. The cathedral or so-called cloisterkirche was founded 1482. A good rathhaus; S. Nicholas-kirche, and four other churches; a modern gymnasium. Near is the picturesque ruin of Sandau. 26. 28. 50.

SCHAUBERT (professor EDUARD), born in Silesia; studied at Breslau and at Berlin. He went to Athens, where he was much employed in alterations in the town together with Stauffert Erlacher, and others. He assisted in the important excavations at the Parthenon; HANSEN, SCHAUBERT, and ROSS, *Acropolis von Athen*, fol., Berlin, 1839; and in ALLGEMEINE BAUZEITUNG, for 1855, pl. 723-8. He erected the tomb to Otfried Müller who died at Athens; and designed 1843-6 the observatory; BUILDER *Journal*, iv, 112; ALLG. BAUZ., 1846, pl. 29; ARCHITECT *Journal*, ii, 174. He retired to Rome in 1844. 68.

SCHAW (WILLIAM), born 1550, was probably a younger son of Schaw of Sauchie. "He travelled in France and other kingdoms for improvement of his mind, wanted no liberal art or science, was skilled in architecture," as stated on his tomb. 1580-1 January 28, his signature was attached to the parchment deed of the national covenant signed by king James VI and his household at the palace of Holyrood: 1584 he became "maister of wark" with 500 marks as "yeirlie feall" or salary, succeeding sir Robert Drummond of Carnock (until 1602 when he was succeeded by James Murray); 1585 Sept., £315 was paid him for work at the "castell of Striveling"; and 1590 May, £400 at "hous of Dumfermling". He was employed on various missions to France. 1585 appointed one of the three to receive the three Danish ambassadors who came to the king respecting the alliance with one of the daughters of Frederick II; and in the winter of 1589 accompanied the king to Denmark, returning 16 March 1589-90 to make the necessary arrangements for

K

the reception of the royal party. *BANNATYNE CLUB, Marriage of James VI*, 4to., Edinb., 1828, p. 15, 29; and App. No. 3. 1589-90 March 14, was paid £1,000 expended "in bigging and repairing" of Holyrood house and the church; and £133 6s. 8d. was paid to him for dress, etc., on the marriage, and the queen's coronation 17 May. On Dec. 23, 1598, he "sett down" the statutes and ordinances to be observed by all the master masons; LAURIE, *Hist. of Free Masonry*, 8vo., Edinb., 1859, 2nd edit., p. 441. As "general warden" he exercised authority over the masons of Scotland, but it is not known if he was a member of the fraternity of freemasons. He subscribed the "statutes" of 28 Dec. 1598, and those of 1599, as described in GOULD, *History of Freemasonry*, 4to., London, 1883, ii, 382; 387-91; 426.

He died 18 April 1602, and was buried in the abbey church of Dunfermline (he is said to have rebuilt one of its west towers), where a tomb erected by the queen records him as "regis operibus prefectum, sacris ceremoniis prepositum regine questorum", with his monogram and mason's mark; *BRITISH ARCHITECT Journal*, 1877, viii, 19. His portrait is in the grand lodge of freemasons of Scotland; LAURIE, 1859, p. 320; his signature is given in *Laws, etc., of the Grand Lodge of Scotland*, 8vo., Edinb., 1848, p. 113-9. James Schaw, executor, applied 1612 for his arrears of salary. John Schaw 1609 was served heir of his father's brother. D. MOYSIE, *Memoirs*, BANNATYNE CLUB, 4to., 1830. Rob. MONTEITH, *Theater of Mortality*, 8vo., Edinb., 1713. ABBOTSFORD CLUB, *Melrose Papers*, i, 95.

SCHEAM or SCHEME ARCH. Also written Schoene, Skene, Skeme, and Skeen. An arch less than a semicircle; a discharging arch. When of an elliptic form, each side of the centre was called the scheme, and the ends the hance or HANSE; MANDEY, *Measuring*, 8vo., London, 1717, p. 21; 26: (was it derived from *Fr. anse de panier*?) MOXON, *Mechanick Exercises* (Bricklayer), 8vo., London, 1700, p. 33; 39. LANGLEY, *London Prices*, 8vo., 1750, p. 219. WARE, *Architecture*, fol., London, 1756, p. 112. SMIRKE, *Mode of forming a straight head*, etc., in *ARCHÆOLOGIA*, 1838, xxvii, p. 383. 1. 16.

SCHEDULE OF PRICES. A document forming part of a contract, and intended to be used for ascertaining (after execution) the sum to be paid for works performed, whether by measurement or by day work. It should be a list of items—of work, materials, and labour, adapted to the intended works, carefully compiled with particular regard to the works to which it refers and the circumstances under which they are to be executed, and prepared from experience of undertakings where the quantities were of similar extent and distribution among the several trades. It should be practically a list of quantities for the intended works with the quantities omitted, or preferably, when possible to do so, with the quantities of each item filled in approximately as nearly as circumstances will permit.

It should include besides the items of work to be measured, prices for workmen's time and for materials to be supplied and used in "day work". Stipulation should be made for all works executed and not specifically mentioned being priced in accordance with the spirit of the schedule prices. It should provide for a percentage of profit to be allowed to the contractor on the net prime cost (after deducting all discounts and allowances), of all items to be purchased from the merchant or manufacturer and paid for by him, and on other like payments out of pocket. It should also provide that all prices are to be taken to include all necessary scaffolding, staging, plant, tackle, labour, and superintendence, requisite and necessary for the proper setting out and execution of the work (subject, however, to special exceptions). In many cases it will be necessary that, especially as regards brickwork and masonry, the principles on which it is intended that the work should be measured be clearly stated. The schedule should be accompanied by the general conditions of contract, which will specify limit of time, mode of payment, etc., etc., and by a general statement of the nature and extent of the work, and any peculiar circumstances of site or otherwise affecting the work.

When time cannot be allowed for preparing a BILL OF QUANTITIES, or where the extent of the work cannot be exactly settled beforehand, a schedule is usually adopted: also tenders are sometimes obtained on an approximate bill of quantities, to the items of which the builders competing affix prices, and carry out the result in the usual manner, the lowest total being accepted; and the work as executed is then measured and valued at the prices affixed to each item in the accepted schedule.

Another system is to issue a schedule fully priced out and invite tenders at a percentage above or below such prices, either over the whole, or on or off each particular trade.

The more frequent use of a Schedule of prices is in its application to variations on a contract: when it is not intended that the Bill of Quantities should form part of the contract, a short schedule is usually appended to the specification containing a few of the principal items—for measured work in variations, and the rates for day work; the latter only being required when the quantities form part of the contract or are to be used as a schedule of prices. LEANING, *Quantity Surveying*, 8vo., London, 1880, p. 172-186.

A. C. SCHEDULE OF QUANTITIES, in the North, *i.e.*, Scotland, is the same as the BILL OF QUANTITIES in the South. In Glasgow, copies of the schedules are sent to the tradesmen and returned priced to the architect, and the whole of the work is measured after execution. HONEYMAN, *Bills of Quantities*, etc., read at Royal Institute of British Architects, *Transactions*, 1878-79, p. 181-200.

SCHEELE'S GREEN. A compound oxide of copper and arsenic, or arsenite of copper. A beautiful, light, warm, green colour, opaque, permanent in itself and in tint with white lead, but is soon destroyed by Naples yellow. Schweinfurt green and Vienna green are similar. These pigments are less affected by damp and impure air than the simple copper greens. 9.

SCHEINPFEL or Schimpfenpeil (CARL or HANS), of Stockholm, was 1289 baumeister of the Minoriten kirche; and 1310 baumeister at the kirche der Italiener zu Marie Schnee, at Vienna, erected 1305-30, and restored 1765-90 by G. da MILANO. 26. 68. 92.

SCHULDEN (PAUL VAN), designed and executed 1529 the immense and elaborately carved chimney piece in the salle des Séances, in the palace of justice at Bruges; he is also supposed to have carved 1531-4 the door screen at Audenarde, both in a bold cinque cento character of the Renaissance. The details of his life are unknown. Casts of these works are in the South Kensington museum; Cat. of *Casts*, etc., p. 38-9.

SCHELLART (GERHARD FRIEDRICH VON), called Chorus, burgesmaster at Aachen, 1253 erected the rathhaus (a fire in July 1883 burnt the two towers and the roof of the hall between them, and was stopped by the stone vaulting; *BUILDER Journal*, p. 41-2). He also erected the choir, begun 1353 and finished 1413, of the münster. 92.

SCHEME; see SCHEAM; and SCHENE.

SCHEMERL (JOSEPH), ritter von Leytenbach, designed the polytechnic institute at Vienna. He was living about 1836. 14. 26.

SCHENDELER (MEISTER JOHANNES), 1340 commenced the Wiesenkirche at Soest. 92.

SCHENE (Gr. σχήμα) or SCHEME. The representation of any design, or geometrical figure, by lines so as to make it comprehensible. 1.

SCHERER (JOHANN JACOB), born 1676 at Schaffhausen, was bricklayer, mason, learnt stucco-work and drawing, and designed and built the rathhaus at Zurich; a convent in Solothurn; and other structures in Switzerland and Germany. He died 1746. 68.

SCHIATTI (ALBERTO), of Ferrara, designed 1531 the church of La Madonna; 1570 that del Gesù enlarged by C. Pasetti and P. Palmieri (the college being of later date); Sta. Francesca, completed 1622; 1570 S. Cristoforo with its founding hospital; and 1575 S. Paolo. AVVENTI, *Il Servitore—guida*, 8vo., Fer., 1833.

SCHIAVI (VICENZO), of Verona, also a sculptor, had a son BERNARDO, an engineer. His brother PROSPERO designed many palaces, and died 1647, aged 54. Another brother CARLO also practised. Giuseppe Antonio, son of Prospero, was a sculptor. Pozzo, *Vite Veronesi*, 4to., Ver., 1818, Supp. 26.

SCHICKETANZ (HANS), was employed in Dresden in the first half of the XVI century as *steinmetz*, where in 1527 he was bridgemaster, and *steinmetz* of the Kreuzkirche; 1534 he built the ducal Georgen-schloss; and carved the dance of death consisting of twenty-seven figures in bas-relief. 68.

SCHICKHART (HEINRICH), of Nassau-Siegen in Württemberg, began 1440 the rebuilding, and another of the same names, continued 1515 the stiftskirche at Herrenberg, and finished 9 March 1517 the stalls in the choir. His grandson of the same names, born 1558 at Herrenberg, was erecting two noblemen's residences before he was twenty-two years of age. He was sent for 1590 and 1595 to take part in royal and public works, and for two reigns was in constant favour and employ. He 1598-9 visited Italy; 1599-1609 designed the Neubau at Dresden (pulled down 1780); assisted baumeister Behr in the theatre; and 1601-8 designed the stiftskirche at Freudenstadt in the form of two wings at right angles. His notebooks relating to his tour 1599 in Italy, were published *Beschreibung einer Reise welche ... F. Herzog zu Württemberg, etc., im Jahre 1599*, by J. Rathgeb, 4to., Tübingen, 1603. He was killed 1634 by robbers during the thirty years' war, in his house at Herrenberg. HEIDELOFF, *Kunst—in Schwaben*, 4to., Stuttgart, 1855, p. 2 and 6. GEMMINGEN, *Lebensbeschreibung H.S.*, 8vo., Tüb., 1821. 68. 92.

SCHIEGGIA (LA). A walled village, on or near the Roman station Ad Ensam. The ruins of the celebrated temple of Jupiter Apenninus are still traceable on Monte Petrara, to which the confederated tribes of Umbria repaired to sacrifice; there are also vestiges of baths. It has a cathedral, and an ancient palazzo. The ponte a botte, of one arch, across the ravine 170 ft. above the torrent, was built 1805 by Fabri for pope Pius VI; above the arch is a cylindrical aperture 65 ft. diam., raising the roadway on a level with the approach on either side, to 235 ft. above the torrent. 28. 50.

SCHIFFERING (JÖRG), of Noerdlingen, baumeister, was sent for to build at Vienna 1316 the church of S. Elizabeth; (restored 1395, and modernised 1719); and 1326 the chapel of the German knights. 26. 68.

SCHILSHAYNER (MICHAEL), about 1380 built the Magdalenen kappelle at Schliersee. 92.

SCHIMPFENFEL (HANS); see SCHEINFEL.

SCHINKEL (KARL FRIEDRICH), was born 13 March 1781 at Neu-Ruppin in Brandenburg, where his father, who died in 1797, was superintendent. Soon after 1795 he became a pupil of David Gilly, whose son Friedrich returning 1798 from his travels, imbued Schinkel with the love for art of a more enlightened character than was entertained in those days (he died August 1800). Completing his master's works, he designed for modellers, metalworkers, and others, gaining thereby sufficient to travel 1803-5 to Italy, Naples, and Sicily. Being forced to practise landscape painting at Berlin, he also painted a panorama of Palermo, with scenes for the theatre, a collection of which was published in 32 plates.

His first commission from king Fred. William III was to design a cathedral (not carried out) to commemorate the pacification of Europe; and 1816 he examined the state of Cologne cathedral. At Berlin he designed 1818 the hauptwache or royal guardhouse (given in *Sammlung*, pl. 1-4); the schauspielhaus or theatre after the fire of 1817 (pl. 7-18; GRANVILLE, *Guide to S. Petersburg*, 1835, i, 283); 1820 the large military monument (Gothic) on the Kreutzberg outside the Halle gate (pl. 22); 1823-9, the museum (pl. 37-42, and 103-9; *Guide*, i, 267); 1825-8 the Werder'sche-kirche (Gothic); the bau-schule or architectural academy, using terra-cotta ornamentation (pl. 121-6; 151-2; ALLGEMEINE BAUZEITUNG, 1836, Ser. 1, pl. 1-8); finished

1836 the observatory (pl. 153-4); about 1835 the neue packhof or custom house (pl. 127); 1836 the new city gate near the Charité hospital (pl. 155-6), and the Potsdam gate (pl. 23-4); also 1833 palace of count Redern (pl. 143); altered 1816 that of prince Frederick; altered that of Prince Charles in Wilhelm's platz (pl. 171) with a fine armoury; 1832 the colonnade to that of prince Albert in Wilhelm's strasse; school for the artillery and engineers (pl. 33; 112); and other buildings named *s.v.* BERLIN, p. 71a.

At Potsdam; he 1824-37 enlarged the small villa (erected for count Hardenberg) for prince Fred. Charles (pl. 169-71); designed the schloss Krzesowice for the family Potocki (pl. 43-8); Charlotten-hof for king Fred. William IV (pl. 109-112, and 10 plates); 1830-37 Nicolai-kirche, cupola omitted (pl. 132-6); the casino (pl. 78); and a counting house (pl. 60). At Hamburg; the stadt-theater (pl. 73-7); Königsberg 1839-43, the Altstadt-kirche; Charlottenburg, the mausoleum sometimes attributed to H. Gentz; and 1823 a house for the banker Behrends in platz Louisa (pl. 36); Brandenburg 1836 restored the cathedral; Aachen designed the trinkhalle; Schloss Erdsmansdorf, the church; and at Dresden 1833 the hauptwache (pl. 144).

He published *Sammlung Architectonischer Entwürfe*, containing works finished and in contemplation, lar. fol., 174 plates, Berlin, 1827-40; new ed., 1841-45; another ed., 1857-8. This contains the Sing akademie for Berlin, six designs for a monument to Frederick the great, and others (the numbers in brackets in this article refer to this work). The *Werke der Höheren Baukunst*, gives a series of designs, 1862 for a palace at Athens; and 1839 a design in 15 pl. for a summer palace at Orianda in the Crimea for the empress of Russia; Schloss Glienecke for prince Charles of Prussia, 10 pl. Restauration des Tuscum und Laurentinum 6 pl.; Schloss Babelsberg, carried out by Persius. He was appointed Ober-Landes-baudirektor, the highest rank in the profession. The king is said to have given 30,000 dollars for the drawings and plans left by him, as some provision for the family. The "Schinkel gallery", which forms part of the architectural academy at Berlin, contains the large and curious collection of relics and drawings by him; *ATHENÆUM Journal*, Oct. 1862, p. 438; *BUILDER Journal*, 1862, xx, 757. Among his immediate pupils were Stüler, Knoblauch, Bürde, Menzel, Geisler, and Strack. Most of his designs exhibited a modification of the Greek style. His health failed shortly before his death, 9 October 1841.

FOREIGN QUARTERLY REVIEW, *Present School of Architecture in Germany*, xxvii, 1834, p. 92-118. RACZYNSKI, *L'Art Moderne*, etc., 4to., Paris, 1836, iii, 140. SPIKER, *Berlin und seine Umgebungen*, etc., 4to., Berlin, 1838. PAETSCH, *C.F.S., letzte krankheit und Leichenbefund*, etc., 8vo., Berlin, 1841. ALLGEMEINE BAUZEITUNG, 1842, p. 147, 275. KUGLER, *K.F.S., Eine Charakteristik*, etc., 1842, and GRUPPE, *C.F.S. und der neue Berliner Dom*, 8vo., Berl., 1843; both give portraits, the former from the bust by Rauch, the latter being in his usual dress with his hat on. A statue by Drake 1869 is on the Schinkel-platz. *Berlin and its Treasures*, 4to., Leipzig, 1853-8, p. 94. *Nash and Schinkel*, in *BUILDER Journal*, 1855, xiii, 585. VON KLÖDEN, *Biog. berh. Baumeister und Bildhauer*, 8vo., 1855, etc. *Aus Schinkel's Nachlass; Reisetagebücher, briefe und aphorismen*, 4 vols., 8vo., Berlin, 1862-4. MAX RING, *Die deutsche Kaiserstadt Berlin*, 4to., Leip., 1883. 68. 14 supp.

SCHLEIFFE (PIERRE), born 1601 at Valenciennes, was chiefly a sculptor, employed in the church of the abbey of S. John; and in that of the abbey of Vicogne, where he executed the jubé and high altar and three gables. He died 14 August 1641; in the epitaph he is styled master architect and sculptor. COMMISSION HIST. DE BRUXELLES, *Bulletins*, 8vo., Brux., 1849, xv, 141.

SCHLESWIG (Danish *Slesvig*). A seaport, dating from IX cent., in Denmark situated on the river Schlei or Sley, here crossed by a bridge. The market place, the only public square, is in the

Altstadt; the principal street exceeding two miles in length is in the Lollfuss portion. The cathedral dates in XII cent., but was rebuilt after a fire in XV cent. The fine carved oak altarpiece herein, 1515-21 by Hans Bruggemann, was removed 1668 from the monastery at Bordesholm in Holstein. BÖHNDEL, *H. B.'s Altar, Bgl. Schleswig'sche Kunst*, Sch., 1792. The round church of S. Michael dates from the Crusades. The church and convent of S. John has a remarkable Lady chapel, *cir.* 1250 and older portions. The castle of Gottorp on an island in the bay, XVI cent. and later, is now the public offices. Remains of the famous wall called the Dannevirke, erected by the pagan kings to protect the duchy from the incursions of the north Jutlanders, still exist near the city. 14. 28. 50. 92. 96.

SCHLUETER (ANDREAS), born 1662 or 1663 at Hamburg, was a pupil of Sapovius at Dantzic, and became "the greatest sculptor and architect in Germany during a debased period of art". In 1691 he went to Warsaw, where he carved some work for the king, and 1694 was called to Berlin as the king's sculptor; about 1697 designed the arsenal (greatly altered 1700 by de Bodd); 1699 was appointed schloss-baudirektor; 1700-6 designed the chief part (east side and east end of north façade) of the palace as it still remains, including the great staircase and the side next the smaller courtyard; the elongation of the south front was done 1715 strictly after Schlueter's design by his pupil Bohme; 1706-9 at Charlottenburg he designed the corps de logis and the orangery, with the interior decorations of the palace. At Berlin, the old post office, now a private house, by the long bridge, at the entrance of the Königstrasse; and the palace of ... Kenke behind the Neustädter-kirche. He raised the munzthurn to 230 ft., the foundations failed and it had to be pulled down in haste; the architect was dismissed 1707 by the jealousy or intrigues of Eosander, it is said. 1712 he designed the building used by the royal York Lodge of Freemasons. Many designs made by him were published in a work by J. B. BROEBES, Berlin, 1733. He executed many good works in sculpture, as the pulpit in S. Mary's church; and died, some say 1713 or 1714 at Berlin, others in Russia. P. Decker, 1699, was another pupil. *Larven nach den Modellen des berühmten S.—Fensterbogens des—Zeughauses* (of Berlin), 20 plates, 4to., Berlin (1770?). VON KLOEDEN, *Biog. berh. Baumeister und Bildhauer*, 8vo., Berlin, 1855, etc. *Berlin and its Treasures*, 4to., Leip., 1853-8, p. 40-7; 79-80. MAX RING, *Die deutsche Kaiserstadt Berlin*, 4to., Leip., 1883.

SCHMIDT (FRIEDRICH CHRISTIAN), born 1755 at Gotha; published *Der Bürgerliche Baumeister*, etc., 5 vols., fol., Gotha, 1790; and died in 1810. 68.

SCHMIDT (HANS), built 1480 the rathhaus at Zerbst. 92. SCHMIDT (JOHANN GEORG), practised at Dresden, where he designed the waisenhaus, the gewandhaus, 1745 completed the towers of the Frauenkirche with a cupola in which is an inclined plane formed between the two thicknesses of the dome (LINDEMANN, 6 plates, Dresden, 1734); 1764-92 rebuilt the Kreuzkirche (the tower 304 ft. high by C. F. Exner or G. A. Hoelzer); and 1763-9 the Annen-kirche. He died 1774 at Dresden. 68.

SCHNEEBERG (HANS); see LOBWASSER (F.), 1516-40.

SCHNELLMER (HEINRICH), of Ingolstadt; see GLAETZEL (C.); died 1431. 68. 92.

SCHOFFEET, in HALFPENNY, *Art of Building*, 8vo., London, 1725, p. 13. NICHOLSON, *Dict. of Architecture*. See SOFFIT.

SCHENUS, in the isthmus of CORINTH, where certain ruins are supposed to have been the HIERUM or sanctuary of Poseidon.

SCHOLA. The platform or ambulatory round a warm water bath; VITRUVIUS, v, 10: sufficiently capacious to admit of those awaiting their turn, to stand there without crowding. The seats in the niches in the frigidarium of the baths are so called. 78.

SCHONHOFER (SEBALD); see RUPPRICHT (G. and F.).

SCHOOL. The establishment of schools for the intellectual culture of all classes of the community having become a matter of national importance, the buildings in which this work is

to be carried on, should be carefully studied to insure the perfection of convenience and fitness in every part.

The *German system* comprises 1, the Burgher or lower middle class; 2, real schule for three kinds of instruction; 3, practical, for scientific subjects; 4, gymnasium, a public secondary school, classic education like the English collegiate or general schools—forming a stepping stone to 5, University, or Polytechnic school. The Prussian system is explained in *BUILDING NEWS Journal*, 1872, xxii, 414; and 1874, xxvi, 89, 162. The French system is noticed herein *s.v.* College.

Besides what has been stated *s.v.* College, the following notes are added: Scholæ Menianæ or Meniana, a celebrated college in ancient Gaul, is described by EUMENIUS, who lived at Autun in III century; Augustodonum was a place of study for the youth of the Gallic provinces even as early as the reign of Tiberius A.D. 21, as mentioned by TACITUS, *Annales*, iii, c. 43. At Bologna, a college was founded 1825 by bequest of the architect Venturoli.

Modern Plans; *ECCLÉSIOLOGIST Journal*, ix, 289. Victoria, Jersey, by John Hayward; *ILLUSTRATED LONDON NEWS*, xvi, 387. Queen's, Ireland; *COMPANION to ALMANACK*, 1849, p. 236. Codrington, Barbadoes; *idem*, xvii, 333; and F. W. N. BAYLEY, *Four Years in the Indies*. Engineers, in War Office, S. Petersburg; GRANVILLE, 1835, ii, 40, 80. Dulwich, and cost of schools; *BUILDING NEWS Journal*, 1869, xvi, 173.

Charity School. Welsh, at Ashford, Middlesex, *BUILDER Journal*, 1857, xv, 290-1. Jews' Hospital, Lower Norwood, *idem*, 1862, xx, 514-5. Independent, Ashton-under-Lyne, co. Lancaster; *idem*, 1862, xx, 298 (largest block in the world).

Farm, Industrial School. *BUILDER Journal*, 1854, xii, 568. *Industrial Schools*, Finchley, *BUILDER Journal*, 1860, xviii, 504.

Grammar School, founded and established for the education, instillation, and instruction of children and youth in the grammar and other good learning. As at Bedford, by J. Horsford, *BUILDER Journal*, xvii, 84, 100. Swansea, by T. Taylor, *idem*, 1853, xi, 72. Sudbury, by R. P. Pope, *BUILDING NEWS Journal*, 1858, iv, 1102. *Petition*, 1447, in GROSE, *Antiq. Rep.*, iii, 412. CARLISLE, *Endowed Grammar Schools*, 2 vols., 8vo., London, 1818. BUCKLER, *Sixty Views of Endowed Grammar Schools*, 4to., London, 1827. BENTLEY, *Excerpta*, p. 5 and at end. *Journal of ARCHÆOLOGICAL ASSOCIATION*, xii, 55, 148, 223. Impressions of forty-four ancient seals, in British Museum, Addit. MSS. xxxv, 120-162. HACKETT, *Collegiate and Cath. Schools*, 4to., 1827.

Hospital School; as Whitgift's, 1596-7, at Croydon, *BUILDER Journal*, xiv, 340. Ripley's, 1856, at Lancaster, for 300 persons, *idem*, xiv, 426. Royal Military Asylum, Chelsea, 1801-3, by J. Sanders, RICHARDSON, *Vitruvius Britannicus*, fol., London, 1808, ii, pl. 42-3.

Infant School (Fr. *asile*), DALY, *Revue Générale*, viii, pl. 14, pl. 26-7-31.

London School Board Schools; from May 1872 when the competitive designs were exhibited. The Annual Reports give an account of the expenditure upon school buildings.

Monastic School. On the dissolution of monasteries, monastic schools were suffered to decay, and new colleges and grammar schools were endowed. Hence there are few buildings remaining which are known to have been devoted to scholastic purposes prior to the reign of king Edward VI; see *Grammar School*.

National School; at Faversham, CIVIL ENGINEER, etc., *Journal*, xvii, 400; *BUILDER Journal*, xiii, 441.

Parish Church School; S. Peter's at Leeds, *BUILDER Journal*, xiv, 1856, p. 662-3.

Ragged Schools; *BUILDING NEWS Journal*, iii, 844. *ILLUSTRATED LONDON NEWS*, xxiii, 520. *BUILDER Journal*, 1857, xv, 313.

Reformatory School; *BUILDER Journal*, xiv, 209; see *Farm and Industrial School*.

Sunday School; *Planning*, *BUILDING NEWS Journal*, 1880, p. 732.

Technical School. ROBINS, *Buildings for Applied Science and Art Instruction*, read at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1882-3, p. 81, includes Munich; Berlin; Central Technical Institution, South Kensington; Yorkshire College, Leeds; Merchant Venturers' Society's School, Bristol; with illustrations, and others described. Also ROBINS, *Fittings for Applied Science Instruction Buildings*, *idem*, 1883-84, p. 5-38, including heating and ventilation, with illustrations.

The chemical laboratories of Bonn and of Berlin are described, with plates, in this Dictionary, *s. v.* Laboratory.

Trade School; CIVIL ENGINEER, ETC., *Journal*, xvii, 17.

Training College. Church of England, at Cheltenham, CIVIL ENGINEER, ETC., *Journal*, 1854, xvii, 41. S. Augustine, at Canterbury, ECCLESIOLOGIST *Journal*, vi, 8, 54. *Public School;* SS. Mary and Nicolas, 1855, at Lancing, Sussex, *BUILDER Journal*, xiii, 333.

Workhouse School. Central London District School, at Hanwell, £200,000 Dec. 1867. Catholic School, Norton Hyde.

COMMITTEE OF COUNCIL ON EDUCATION, *Rules to be observed in planning and fitting up Schools*, fol., London, 1839-40, contains twenty-three sheets of School houses designed by S. Kempthorne. *Instructions*, in *BUILDING NEWS Journal*, 1860, vi, 521-8. *Idem*, *New Code of Regulations* relative to schools by the Lords of the Privy Council, 8vo., London, 1873. INSTRUMENTA ECCLESIASTICA, 2nd Ser., pl. 43-54. KENDALL, *Designs for Schools, etc.*, fol., 1847. CLARKE, *Schools and School Houses*, 27 pl., fol., 1852. NARJOUX, *Les Ecoles publiques en France et en Angleterre, etc.*, 154 illust., 8vo., Paris, 1877. VALLET DE VIRIVILLE, *Hist. de l'instruction publique en Europe*, 4to., Paris, 1849. BARNARD, *Practical Illustrations of the Principles of School Architecture*, 8vo., New York, 1854; reviewed in *BUILDER Journal*, xii, 505-7; 517-8; R. SCOTT BURN, *Arrangement, Construction, and Fittings of School Houses* (abstract of the above work), 8vo., Edinb., 1856. HARRY CHESTER, *Building a School, etc.*, 8vo., London, 1860 (*BUILDING NEWS Journal*, vi, 421; and *BUILDER Journal*, xviii, 461-2). HERBERT FRAY, *Schools and Colleges of Great Britain*, 1st edit., 1867, universities and nearly 2,000 schools. T. ROGER SMITH, *School Buildings and Fittings*, in *SOCIETY OF ARTS Journal*, 25 Nov. 1874. ROBSON, *School Architecture, Practical Remarks, etc.*, 300 illust., 2nd edit., 1877 (very complete).

School Planning; *BUILDER Journal*, 1883, xlv, p. 38, 69, 95. *BUILDING NEWS Journal*, 1873, xxv, *passim*, by E. R. Robson, and his work 1877 above cited. *Sunday School, idem*, 1880, p. 732.

SCHOOL CHAPEL, at Romsey, cheap, by E. W. Lower. *BUILDER Journal*, 1860, xviii, 580. CHURCH *BUILDER Journal*, 1873, April, 51. *On Chapel Schools*, *BUILDING NEWS Journal*, 1859, v, 853.

SCHOOL FURNITURE. *BUILDING NEWS Journal*, 1869, xvii, 243; and 429. *BUILDER Journal*, 1861, xix, 291. SEAT.

SCHOOL HOSPITAL. *BUILDER Journal*, 1861, xix, 489-90.

SCHOOL HOUSE. A Domus scholarum was usually attached to an ecclesiastical edifice. In 1384 a convocation at Salisbury was held in "domo scholarum in cæmeterio ecclesiæ situata". Some other English cathedrals still retain this appendage. 19.

SCHOOL OF ARCHITECTURE. A term generally applied to those who follow a master, as Palladio in England; Serlio, and Scamozzi, and Vignola, in France, Germany, and Spain. It is quite distinct from the "Styles" of Architecture. Bart. BIANCHI, *cir.* 1630 opened at Florence a school of the Fine Arts and Mathematics. Jacques François BLONDEL was the first in France to open one (and the best) of those schools or private academies of architecture, which have tended much to the advancement of the art in that country. He obtained 6 May 1743 the approbation of the Academy of Architecture, and taught with several assistants all branches of the science and art of building. Bernardo Timante BUONTALANTI was one of the first Italian architects that had a school of pupils in his own house; died 6 June 1608. Herrera was undoubtedly the originator of

the architectural academy founded by king Philip II (1555-98) which followed with more or less success the path opened by him (A. P. S.). Achille F. R. LECLÈRE opened 1815 an atelier at Paris; his numerous pupils in 1826 published a *Recueil d'Architecture* in his honour. The system of education by the atelier is now common in Paris; ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1884. W. H. WHITE, *Architecture and Public Buildings, etc.*, 8vo., London, 1884.

It is also applied to the distinct branches of architecture in Italy, as the ROMAN SCHOOL, comprising Bramante, Sanzio, Giocondo, Giuliano da Sangallo, Peruzzi, Ant. da Sangallo, Buonarroti, Sansovino, Jacopo della Porta, Dom. Fontana, Pirro Ligorio, Maderno, Barozzi da Vignola, Borromini, and Bernini. The FLORENTINE SCHOOL, comprising Arnolfo di Lapo, Giotto, Pollaiuolo, Gaddi, Orgagna, Brunellesco, Fancelli, Michelozzo, Alberti, Sanzio, Ammanati, Buontalenti, Ben. da Majano, Baccio d'Agnolo. And the VENETIAN SCHOOL, comprising San Michele, J. Tatti Sansovino, Palladio, Serlio, V. Scamozzi, Gio. da Ponte, and Vittoria. *Present School in Germany*, in *FOREIGN QUARTERLY REVIEW*, 8vo., 1832. 1. 2. 5. 6. 14. 19.

SCHOOL OF ART, and School of Practical Art. These are the outcome of the School of Design established by the Government 1837 at Somerset House. In 1884 there were 177 distinct schools of art in the United Kingdom without counting the branches connected with some of them. The annual cost is now £26,376. The National Art Training School, at South Kensington. At Wolverhampton, by Ed. Banks, CIVIL ENGINEER, ETC., *Journal*, 1855, xviii, 69, and plates. At Nottingham, etc., *BUILDER Journal*, 1862, xx, 791. At Warrington the school building is on a grand scale.

The School of Art at Lyons was originated in a decree of Bonaparte dated at Warsaw; its object was to give elementary instruction in Art with a view to the improvement of the silk manufactories of France: it is now extended into six principal departments. France, Switzerland, Bavaria, have largely availed themselves of these schools of instruction.

SCHOOL ROOM. The apartment in a private mansion appropriated to children under a tutor. It is often used as the day-room of the pupils and the sitting-room of the teacher. To form a complete suite there should be contiguous to the schoolroom, a teacher's sitting-room and bedroom, a private entrance lobby, washing closet, and perhaps a book closet, as being better than a cupboard in the room itself. KERK, *Gentleman's House*, 3rd edit., 8vo., London, 1871, p. 147.

SCHORNDORFF (MARTIN), 1564 designed the sides of the cloister of the Bruderhoff, or hôtel des Frères, next to the choir leading to the chapter house, at Strasbourg. They were demolished 1769. GRANDIER, *Essais, etc., de Strasbourg*, 8vo., Stras., 1782, p. 392.

SCHORR (P...). The gallery of the palazzo Colonna at Rome is ascribed to him, and also to A. del GRANDE, and to Gir. Fontana, *cir.* 1655.

SCHRANKH (CONRAD), of Ingolstadt, was 1327-42 baumeister of the large Cistercian Stiftskirche in the Steiermark at Neuberg; dissolved 1786. 26.

SCHROEDER (EPHRAIM), employed 1727-90 in Poland.

SCHUMACHER (JACOB); see SHUMACHER. 68.

SCHWARZ (JULIUS HEINRICH), of Dresden, practised there in a purer style than the usual French taste. He prepared designs for very many palaces and other buildings, of which several were executed, amongst them a garden palace for the elector. The hof or Katholische-kirche, designed 1737 by G. Chiaveri, was superintended 1752-8 by Schwarz (Sebastian, J. C. Knoefel) and finished by Exner as he became blind. Zucchi engraved many of his designs for decorations for king Augustus III of Saxony and Poland; and for the elector Frederick Christian; and 30 plates of ornaments. Schwarz was oberland baumeister, and died 1775 in his 69th year, at Dresden. 68.

SCHWEINER (HANS), of Weinsberg, 1507-29 finished the tower of the Kilianskirche at Heilbronn. 68. 92.

SCHWEINFURT BLUE. A carbonate of copper, not durable; used in oil it becomes green. **SAUNDERS BLUE.** Schweinfurt green is a fine preparation of Scheele's green. It is obtained by dissolving arsenious acid and the acetate of copper together; and is injurious to the workmen manufacturing it. 9.

SCHWERIN (Lat. Alistus). The capital of the grand duchy of Mecklenburg-Schwerin. It is well built and has four public squares. The *dom* or cathedral, one of the finest Gothic churches of brick in North Germany, dates 1222-48; completed 1350-70, (1365-1430); restored 1853; it is 305 ft. long, 135 ft. wide, and 102 ft. high; in it is a fine bronze tomb 1524 by Peter Vischer; and brasses 1314-75. The public offices date 1825-35; the *schloss* or palace, with chapel and armoury 1845-58 (French renaissance) on the site of a former castle, on an island, fortified, with drawbridge, etc., is supposed to have cost £500,000; an antiquarium of prehistoric remains; and arsenal and barrack 1844. **ESSENWEIN**, *Norddeutschlands Backsteinbau im Mittelalter*, fol., Carls. (1855). 14. 28. 50. 92. 96.

SCHYNVOET (SIMON), born 1652 at the Hague; spent the greatest part of his life at Amsterdam, where he designed various country residences and large houses, and also on the banks of the rivers Amstel and Vecht. He 1689 engraved and published many of the antiquities, coins, and curiosities in his collection. He died about 1724. 24. 68.

SCIACCA MARBLE. A limestone containing shells and generally of a brownish colour, obtained from near Girgenti in Sicily, used in the churches at Palermo. **WOODS**, *Letters*, 4to., London, 1828, ii, 348. **SELINUNTUM.** 50.

SCIENCE IN ARCHITECTURE. This has been considered to comprise the knowledge of all the materials used in building, and the manner of employing them; the art of architecture is considered to relate to history and design.

SCILL and SOIL. Old ways of writing **SILL.**

SCIMA. An old way of writing **CYMA.** 4.

SCIMATIUM. An old way of writing **CYMATIUM.**

SCIOGRAPHIA and **sciographia.** The art of projecting SHADOWS as they fall in nature.

SCORE, DE LO; see **FIGURE DEL SCORE.**

SCIOTTO (ANGELO), designed the façade of the church of Spirito Santo, at Padua. **ROSSETTI**, *Padua*, 12mo., 1780, p. 271.

SCIRI (SCIRO), of Castel Durante, was according to DE PAGAVE, in his commentaries in the edition to **VASARI**, *Vite*, 8vo., Siena, 1791, master of Donato LAZZARI, called Bramante.

SCITE. An old way of writing **SITE.**

SLATTE. An old way of writing **SLATE**; from Lat. *Scatlata*, *scatlatis*; and *scatlatus* or slate stone; 1307, 1450; **SURTEES SOCIETY**, *Pinchale Priory*, 8vo., Newc., 1837, p. 446. 19.

SCLOPENDRUM. A genus of ferns; S. vulgare, Hart's tongue, is often used in patterns for decoration and carving. **FERN. FLOWER.**

SCOINSON ARCH (Fr. *escoinson*; or *accointsons*, pieces of framing added to prolong in any direction the roof of a building).

Also **REAR and REAR ARCH.** The interior edge of a window side. **SHARPE**, *Decorated Window Tracery*, 1849; and **ARCHITECT Journal**, 1849, ii, 80. **VIOLLET LE DUC**, *Diet.*, s.v. *Vitrail*, p. 392. **SCONCE.** **SCUNCHION.** **SKUNCHION.** **SQUINCH.** 16. 17. 40.

SCOLARI (FILIPPO), designed the church of Sta. Maria degli Angeli, at Florence, rebuilt 1700 by F. Franchi.

SCOLES (JOSEPH JOHN), born 1798 in London, was articulated June 1812 to ... Ireland, the leading Roman Catholic architect of that time, whose office he quitted in 1819, and designed a house for ... Roberts at Esher. In 1822-26 he visited the chief countries on the continent, Sicily with Angell and Harris, the Levant and Egypt (publishing with H. Parke a *Map of Nubia* 1829), and in Syria, devoting much time to the survey of the holy places; eight papers of his researches are given in the catalogue of the Roy. Institute of British Architects, such as the *Parthenon* 1846, and *Jerusalem* 1849. The temple at *Cadachio*, in Corfu, was drawn by him and appeared under another name in **STUART AND REVETT**, *Antiq. of Athens*, IV or Supp. vol., fol.,

London, 1830. The plan of the church of the Holy Sepulchre at Jerusalem in prof. Willis's work on that subject is made from sketches by Mr. Scoles.

On returning to England he 1831 designed at Great Yarmouth, S. Peter's church, a chapel at Southtown, and 1830-32 a bridge (accident, **BUILDER Journal**, 1845, iii, 253); S. George's church at Edghaston for lord Calthorp (COMP. TO THE ALMANACK, 1836, p. 231); 1832 S. Peter's church at Stonyhurst college (*idem*); 1833 church in Grove Road, S. John's Wood; and at Holywell; 1834 S. Ignatius church at Preston (*idem*); others 1837 at Colchester; 1840 Newport, Monmouthshire; 1842 Cardiff; and 1843 S. John, Duncan Terrace, Islington (**BUILDER Journal**, 1843, i, 98-9). In 1844 he commenced a large church never completed, at Prior Park, near Bath; others at Bangor; Merthyr Tydvil; and Lydiate, near Liverpool; Chelmsford (**BUILDER Journal**, 1847, v, 545); 1846-49 S. Mary, or church of the Immaculate conception, Farm Street, Berkeley Square, £8,000 (CIVIL ENGINEER, ETC., *Journal*, ix, 171; **BUILDER Journal**, vii, 259); 1850 at Great Yarmouth; 1862 S. Helen's, Lancashire; the London Oratory, residence and temporary church for the Order of S. Philip, Brompton Road; and large schools in Charles Street, Drury Lane. For ten years he was hon. secretary to the Royal Institute of British Architects, and later vice-president; and one of the founders of the Syro-Egyptian Society. Among his pupils were S. J. Nicholl and T. J. Willson. He died 29 December 1863. **BUILDER Journal**, 1864, xxii, 41. 68.

SCONCE. The term used in Scotland for a short partition on one side of a fire in a cottage, upon which all the bright utensils are suspended.

Lat. *absconica*; Fr. *escosse*. A dark lantern; a branch to put a light into. **LOCK**, *Six Sconces*, fol., London, 1768.

The words "quatuor sconi" are used by **WILLIAM OF WORCESTER**, *Itin.*, 196, implying four-arched buttresses. 17. 19. 80.

SCONCHEON: sconchon; scuncheon; scuntin; see **SCOUNSON**; **SKUNCHION**; and **SCUTCHEON**.

SCOOP WHEEL. An undershot water wheel working reversely to a mill wheel, driven by wind or steam, to lift water from a low to a higher level, whence it flows by gravitation to the sea at low tides, and so fen lands are drained. Scoop wheels vary from 10 ft. diam. by 1 foot wide, to 40 ft. diam. by 4 ft. wide; but as they cease to be effective when flood waters rise nearly to their axles, they are becoming superseded by centrifugal pumps working at high speed. George Hamit of Haddenham patented an improvement whereby the water to be lifted is kept close to the paddles of the wheel. R. R. R.

SCOPAS. A native of Paros, an island in the Ægean sea, who was chiefly a sculptor, and flourished between Olymp. 97 and 107, i.e., 390-349 B.C. At Tegea in Arcadia he assisted in rebuilding the Ionic temple of Minerva Alea after the fire in Olymp. 96, 2. It was considered the most sumptuous in the Peloponnesus, surpassing that at Olympia; **PAUSANIAS**, viii, 45. He assisted in the erection of the temple of Diana at Ephesus, after Olymp. 106, 1; **PLINY**, xxxvi, 14; who xxxvi, 5, states he was actively employed with Bryaxis, Timotheus, Leochares, and Pytheus, in embellishing the mausoleum at HALICARNASSUS; the king died in Olymp. 106, 4; B.C. 353. **STRABO**, xiii, p. 604. **LEAKE**, *Pelop.*, 8vo., London, 1846, p. 110-1. **LYDD**, *Age of Pericles*, etc., 8vo., London, 1875, ii, 255-68. **BLOUET**, *Morée*, fol., Paris, 1831-3, ii, 83. **SILLIG**, *Artists of Antiquity*, 8vo., London, 1836, suggests there was also a Scopas of Elis. 3. 14. 68.

SCORCHING WOOD, or breaining, and afterwards saturating it with train oil, forms a partial protection from the worm; **CIVIL ENGINEER**, ETC., *Journal*, 1857, xx, 16. Tar or creosote are also used.

SCORCHIONE (J. DI); see **SQUARIGIONE** (J. DE).

SCORING; see **SCRATCHING**, in plastering.

SCORNALOCO (GABRIELE), of Piacenza, 24 Sept. 1391, as "expertus in arte geometrica" was consulted on the duomo at Milan. **FRANCHETTI**, *Duomo*, fol., Milan, 1821. **GIULINI**, *Memorie*, 4to., Milan, 1760-71, xi, 444.

SCORTICONE (DOMENICO), of Lombardy, a pupil of Taddeo Carloni, practised at Genoa, where he executed many works in sculpture, and designed many palaces; and with G. della Porta, the church of Sta. Annunziata del Guastato. He died at Genoa in prime of life. GAUTHIER, *Génes*, fol. 1818, i, pl. 85-7. 5. 30.

SCOTCH method of brick burning; see BRICK, p. 140.

SCOTCH BUILDING CRANES, erected on timber piling, the crane being set at the top of the building. SCAFFOLD.

SCOTCH FIR; see PINUS.

SCOTCH FOOT. The old length appears to have been equal to 12.0194 imperial inches, being a third of the Scotch ell of 37.0598 imp. ins., or $3\frac{1}{2}$ Scotch feet = 1 Scotch ell. Act of Parliament 5 Geo. IV, sec. 1, 1824-5, and 6 Geo. IV, annulled this measure. BUCHANAN (G.), *Tables of Weights and Measures of Scotland*, 8vo., Edinb., 1829; 1838.

SCOTCH FREE STONE. See HUNTERSHILL and Coltmuir quarry, with the Crowhill, Milton, Giffnock, and Kenmuir quarries, all situate north and south of Glasgow. CRAIGLEITH quarry, near Edinburgh. Caithness paving stones; BUILDER *Journal*, 1869, xxvii, 390. GEIKIE, *Geology of Scottish Building Stones*, read at Edinburgh Architectural Association; BUILDER *Journal*, 1 April 1876, p. 311.

SCOTCH SLATES. Slates were brought into use in Scotland about 1550; obtained about 1600 from the island of Easdale, near Oban; and the larger quarries at Ballachulish, on the shores of Loch Leven, which are of equal fame; the other quarries are not of much account, as Dunkeld, Luss, Aberfoyle, and Craiglea, near Perth; BUILDER *Journal*, 1869, xxvii, 391; from BRENNER, *Industries of Scotland*, 1869.

SCOTSEMANNAILEZ, Scotsomnail, Schotnail. In 1434, 5,000 and 7,800 were bought for the works at York minster at a cost of 5s. 5d. and 9s. 2d.; BROWN, *S. Peter, York*, 4to., London, 1847, p. 233; and SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durham, 1859, p. 352, referring to 1371 and later.

SCOTGATE ASH STONE. The sandstone quarries, of the millstone grit series, situated at Pateley Bridge, by which name it is also sometimes known, near Leeds. They afford every class of Yorkshire stone, so that, it is stated, a building of any size can be supplied entire, without going to several quarries for the stones required. Landings up to 130 ft. super. suitable for hard wear; one in 1876 being 17 ft. 6 in. long by 7 ft. wide, supplied for a floor and ceiling in a London bank. Also stone for plain and moulded work. This stone is similar to Elland Edge, Idle Moor, Park Spring, Harehill, and others. It was used at Fountains abbey; and about 1871 for the four lions at Saltaire carved by T. Milnes. The crushing weight is over 700 tons per sup. foot; it resists the strongest acids. BUILDING NEWS *Journal*, 1869, xvii, 296.

SCOTIA. The Greek term for the hollow, or concave moulding, also called *trochilus*, employed in the base of a column between the fillets of the tori; the CAVETTO of the Romans, which is a quadrant, the scotia of the Greeks is a curve frequently formed by the junction of arcs of different radii; properly profiled as a portion of an ellipse. The form also occurs under the drip or cymatium of the Doric entablature. "Like the scotia and fillets of the pedestal, is the scotia to the columns at Samos, to the little temple called of the Ilissus, to the Erechtheion, and perhaps all other examples of antiquity"; INWOOD, *Erechtheion*, fol., London, 1827, p. 70. NICHOLSON, *Principles of Arch.*, 8vo., 1797, ii. CHAMBERS, *Civil Architecture*. I.

SCOTLAND. The architecture embraces:—I. Churches of wickerwork, which in the v century gave way to stone churches, like that built by French workmen at Witherne for S. Ninian; and another in viii century by monks from Jarow. II. Scoto-Irish, from the middle of vi to the middle of xi cent.; it exhibited round towers, beehive houses, dome-roofed cells, small churches often in groups, and as at Iona, priests' chambers over the aisle. III. Romanesque Anglo-Scottish, 1124-1165; or Norman 1066-1145. King Malcolm III laid 1093 the first stone of Durham, and Dunfermline directly after; Leuchars in Fife,

reputed Saxon, has a double story; Dalmeny, equally beautiful; part of Jedburgh; S. Regulus at S. Andrew's (supposed ix cent.); round tower at Brechin; and Kelso. iv. Transitional 1145-1190. Kelso; S. Magnus in Kirkwall; nunnery and cathedral at Iona; Coldingham; Jedburgh, nave; Holyrood, nave; S. Andrew's, east end of choir; Elgin, south transept. v. Lancet 1165-1286, or 1190-1245. Paisley with nave shorter than the choir; while Dunkeld; Dunblane; Paisley; Sweetheart; and Witherne, had choirs without aisles. Brechin; Dunblane, nave; and Witherne, were not cruciform (Sweetheart; Elgin; Pluscardine; S. Andrew's; Aberbrothock abbey church; Dryburgh; and Melrose, had only an east aisle to the transept). Tower of Cambuskenneth; Kirkwall, east end of choir and west doorway; Kilwinning, south transept; Dryburgh, choir; Glasgow, crypt and choir. vi. Decorated 1286-1370 or Geometrical 1245-1315. Elgin, choir screen; New Abbey; Glasgow, transept and nave. vii. Curvilinear 1315-1360. Dunfermline, refectory; Iona cathedral, some windows; Jedburgh, north transept; Elgin, chapter house; Melrose, nave and transept; Lincluden; and S. Monance. viii. Flamboyant, 1371-1550 or Rectilinear 1360-1550 (PERPENDICULAR). Dunblane, choir; Melrose, choir. ix. Revival mixed with Gothic 1580-1680. The flowery period of Scottish art; chimney stalks, crow steps, and open parapets; or square chimney shaft and turrets; or chimneys secondary, high roof, dormers, chimneys and turret, as at Heriot's hospital, which with the work at Linlithgow are both by one hand, perhaps W. Aytoun. Parts at Caerlaverock castle present Italian features before Heriot's hospital; the banded shafts are unique. Wintoun house having no turrets, is unique; and Craigievar, Aberdeenshire 1620 is like it. Many buildings were commenced, and not even meant to be finished. W. Schaw, who is said to have rebuilt one of the west towers of Dunfermline abbey and was buried there in 1602, was the forerunner of a good school of artists. The plaster work of several buildings appears to have been cast from the same moulds. The orders were adopted very charily, 1660, details only being taken, and were very complicated; later, trouble was saved by using no mouldings, except chamfers, as at Dunblane, at Glasgow, and almost all over the south of Scotland.

It has been held that the dates and names assigned by RICKMAN to English mediæval architecture do not hold good to Scottish. Glasgow cathedral in its entire length is a perfect history of the progress of art from about 1230 to 1470. The abbeys of Melrose and Kelso, founded by king David I (1124-53), with Dryburgh and Jedburgh, are all in Roxburghshire. *Cathedrals of Scotland*, in BUILDER *Journal*, 1876, xxxiv, 1154.

Great similarity exists in the buildings of England and Scotland down to the commencement of xiii cent., after which period a considerable difference is to be found. King Edward III, 1372 granted a safe conduct to certain persons who went from Scotland to Flanders to provide a stone for the tomb of king David II; RYMER, *Fœdera*, vi, 721, xxi. There are a few buildings the designs for which may have been derived from abroad, principally on the east side of the country; as part of Holyrood chapel, early French; at S. Andrew's, the entrance lobby to chapter house, including door into same (but not the chapter house), early French Decorated; and a base in south transept, French late Flamboyant; and part of west front same date as lobby; at Aberdeen, columns to central tower, German Decorated; stalls to King's College, Perpendicular, seemingly North Holland work; as is the painted rood screen at Foulis Easter in Forfarshire; at Elgin, a bishop's tomb in the south aisle of choir, probably German Early Perpendicular. Roslyn is stated to have been designed by an architect from abroad. S. Magnus, Kirkwall, is almost entirely Norwegian, having foliated columns and dragon ornamented bases; BUILDER *Journal*, 1856, xiv, 463. J. H. BURTON, *Analogy between the Arch. of France and that of Scotland*; ARCHÆOLOGICAL *Journal*, 1857, xiv, 39. The saddle-back tower and polygonal apse are continental features. The porch forms a characteristic feature, as at Aberdeen, Paisley, and

Dunfermline. Two western towers are only seen at Holyrood, Aberdeen, and Dunfermline. Dunkeld has, as Glasgow had, a north-western tower. Transepts are seldom well developed. Edinburgh has double nave aisles. The spires are poor, but the CROWN STEEPLE (as at Edinburgh, Aberdeen, Glasgow, with Newcastle-on-Tyne in England) is almost unique. Elgin has stone arcades on a level with the pavement.

No other country possesses such a series of castellated architecture for domestic purposes, owing to the clanish constitution. Cities were lines of strongholds, the approaches defended by a fortress, as Stirling. But there is no Norman castle (while Norham, Bamborough, Durham, and Newcastle, all in England, are close on the borders); they were probably destroyed by the magistrates. Caerlaverock, the only one previous to 1350, has also the only instance of a moat remaining. Kildrummy the first recognisable one. Borthwick castle 1430 is a vault or fortress. The Bruces and Baliols left their English castles. Fyvie castle is peculiar; the front is one of the grandest in Scotland. Crossraguel, near Ayr, has on one side an abbey and on the other a complete fortress. Carlisle, in England, is somewhat of the class, the cathedral having three garrison wells. Three miles from Elgin is a genuine Scotch house, fireproof, having the ground-floor for cattle, and a ladder for access to upper floors which are all vaulted alternately, and the roof a pointed arch. HAY, *Castellated Arch. of Aberdeenshire*, fol., 1849. MACGIBBON, *Scotch Castles and Houses*, in BRITISH ARCHITECT *Journal*, xx, 1883.

SHARPE, *Mediæval Arch. classified*, in CIVIL ENGINEER, ETC., *Journal*, 1853, xvi, 90; ECCLESIOLOGIST *Journal*, 1853, xi, 128. WALCOTT, in *Journal of ARCHEOLOGICAL ASSOCIATION*, 1860, xiii, 226; and *BUILDER Journal*, 1860, xviii, 796. ROBERTSON, *Scottish Arch. before the Union*, BUILDING NEWS *Journal*, 1856, ii, 493. BILLINGS, *Ancient Arch. of Scot.*, read at ROYAL INST. OF BRIT. ARCHTS., *Sessional papers*, 3rd April 1848; 3rd Dec. 1849; and 27th Jan. 1851. *Notes for Students of Scottish Arch.*, in *BUILDER Journal*, 1862, xx, 147. W. CLARKE, *Scot. Arch.*, in relation to its Scenery, read at ARCH. INST. OF SCOT., *Transactions*, 1851, i, 171-184. *Scotland and Scotch Architecture*, in ECCLESIOLOGIST *Journal*, 1842, i, 56, 85, 105.

List of early practitioners as architects and master of works; they all are included in this work:—

Scott of Kelso	John Weir
Gilbert of Moray	Thomas of Cochrane, earl of Mar
John Murdo or Murvo	Sir J. Hamilton of Fyuanart
Thomas French or Franche	Alex. Seton, earl of Dunfermline
Sir William of Dischington	Patrick Lyon, 3rd earl of Kinghorn
Alexander of Crichton	and 1st earl of Strathmore
Robert Gray	William Aytoun
John Gray	William Wallace
Richard Ancram	John Montgomery of Old Rayne
Walter of Spot	George Thomson
Alexander Guide	James Smith
John of Livingstone	Sir Will. Bruce of Kilsno
William Valandy	John, earl of Mar
Robert of Livingstone	William Schaw
Sir Robert of Weddall	The Mylne family

ROBERTSON, in ARCH. INST. OF SCOT., *Transactions*, 1851, i, 55-67; and *BUILDER Journal*, ix, 53. *Some Scotch Architects and Building Craftsmen in the XVII century, idem*, 1877, xxxv, 663-4.

x. The architecture since the Revival, *cir.* 1650, has followed the examples set by the English professional men and fashion.

Later practitioners, and whose works will be found noticed *s. v.* Aberdeen, Dundee, Edinburgh, and Glasgow, among other towns:—

Mungo Naismith	J. Carrick,	Glasg.	John T. Rothead,	Glasg.
The Mylne family	John Bryce	"	David Thomson	"
William Adam	David Hamilton	"	Messrs. Clark and	"
James Adam	Thos. Hamilton,	Edinb.	Bell	"
Robert Adam	Robert Reid	"	J. Salmon	"
Colin Campbell	Peter Hamilton	"	James Wyllson	"
James Gibbs	William Nixon	"	John Burnet	"

W. Stark,	Edinb.	Thomas Brown, Edinb.	Thomas Brown (and
James Craig	"	George Smith	Wardrop), Edinb.
Robert Mylne	"	Arch. Elliott	Patrick Wilson
Alex. Laing	"	Robert Black	John Lessells
Richard Crichton	"	David Bryce	Maitland Wardrop
George Angus	"	John Henderson	Robt. Mathieson
J. Gillespie Graham,	"	Wm. Hen. Playfair,	Geo. Thomson, Aberd.
Messrs. Dickson	"	William Burn	John Smith
George M. Kemp	"	Alex. and Geo.	Arch. Simpson
James Newlands	"	Thomson, Glasg.	Wm. Scott, Arbroath
David Cousin	"	Rob. Mathieson	T. Mackenzie, Elgin
Robert Scott, Glasg.	"	David Rhind	Messrs. Reid, Elgin
James Brown	"		

Londoners and others who have practised in Scotland:—

Joseph Bonomi, A.R.A.	J. T. Emmett	R. W. Billings
R. Lugar	Edward Blore	A. Welby Pugin
Sir W. Chambers	J. B. Papworth	Sir G. G. Scott, R.A.
R. Mitchell	Sir C. Barry, R.A.	G. E. Street, R.A.
Thos. Rickman		

Architectural Publications:—ADAM, *Vitruvius Scoticus*, fol., 1751. NEALE, *Views of the Seats of Noblemen, etc.*, 4to., 1824-29. BROWN AND JAMIESON, *Select Views of the Royal Palaces*, 4to., 1830; 1840. BEATTIE, *Scot. Illustrated*, 4to., 1838. BILLINGS, *Baronial and Eccles. Antiq.*, 4to., 1851. LAWSON AND HARDING, *Scot. delineated*, fol., 1847-50; 1854.

DUNCAN, *Itinerary*, 1823. MURRAY, *Handbook of Scotland*, 1867. BLACK, *Pict. Guide*, 20th edit., 1874. MOLL, ADAIR, and others, *Scot. delineated* in 36 maps, 4to., 1745. COOKE, *Modern British Traveller*, etc., 18mo., Lond. (1802-10?).

WEBSTER, *Topog. Dict. of Scot.*, 8vo., 1817. THOMSON, *Directory to Gentlemen's Seats*, 8vo., 1851. CARLISLE, *Topog. Directory*, 4to., 1813. TYTLER, *Hist. of Scot.*, 3rd edit., 8vo., 1845-50. INNES, *Scot. in the Middle Ages*. FORSYTH, *Beauties of Scotland*, 8vo., 1805-8.

WILSON, *Archæology and Prehistoric Annals of Scot.*, 8vo., 1851; 1860. GORDON, *Itin. Septent., Roman Monts.*, fol., 1726-32. SIBBALD, *Hist. Inquiries—Roman Antiq.*, fol., 1707. ANDERSON, *Roman Antiq. between Forth and Clyde*, 4to., 1800. SMALL, *Roman Antiq. in Fife-shire, etc.*, 8vo., 1823. STUART, *Caledonia Romana*, 4to., 1845; 1852.

JAMIESON, *Ancient Cuthers, etc.*, 4to., 1811. SPALDING CLUB; ANGUS, *Sculptured Stones of Scot.*, 138 pl., 1848; fol., Aberd., 1856; reviewed in *BUILDER Journal*, xviii, 651; and ARCHÆOLOGICAL *Journal*, xiv, 186. LOGAN, *Scottish Gael, etc.*, 8vo., 1831. BETHAM, *Gael and the Cimbric*, 8vo., 1834. FORBES-LESLIE, *Early Races of S. and their Monts.*, 8vo., 1866. FERGUSON, *Rude Stone Monts.*, 8vo., 1873.

BANNATYNE CLUB, *Eccles. Antiq. of Scot.*, 1850. CARDONNEL, *Picturesque Antiq.*, 4to., 1788-93. CHALMERS, *Caledonia, etc.*, 4to., 1807-24. CORDINER, *Antiq. and Scenery of the North*, 4to., 1780. CORDINER, *Remarkable Ruins, etc.*, 4to., 1789-95. DALYELL, *Monastic Antiq.*, 8vo., 1809. DUGDALE, *Monasticon Anglic.*, fol., 1717; 1846. FITTLER AND NATTES, *Scotia depicta*, fol., 1804, 1819. GARNETT, *Tour through the Highlands, etc.*, 4to., 1811. GOUGH, *Round Towers of Scot.*, in ARCHÆOLOGIA, ii. GRAMPIAN CLUB; *Monts. and Montal. Inscr.*, by ROGERS, 1871-2. GROSE, *Antiq. of Scot.*, 4to., 1797. MISCELLANEA SCOTICA, 12mo., 1818. MORTON, *Monastic Annals of Teviotdale*, 4to., 1832. (MUIR) *Descriptive Notices of some of the Ancient Parochial and Collegiate Churches of Scot.*, 8vo., 1848; much criticised in ARCHÆOLOGICAL *Journal*, 1848, v, 239; *Characteristics of Old Church Arch. in Mainland and Western Isles*, 4to., Edinb., 1861; and *Barra Head*, 4to., 1866. PENNANT, *Hist. Antiq., etc., in Scot.*, 4to., 1790. RICHARDSON, *Castles of the Borders*, fol., 1834. RUTHERFORD, *Border land*, 8vo., 1849. SCOTTISH SOCIETY OF ANTIQUARIES, *Archæologia Scotica; Transactions, etc.*, 4to., 1782-1857. SCOTT, *Border Antiq.*, 4to., 1814. SIBBALD, *Scotia Illustr.*, fol., 1684. SWARBRECK, *Sketches in Scot.*, fol., 1839; 1845. J. SLEZER, *Theatrum Scotica*, 57 pl., 1693; 1710 and later; and with life 1814; new edition by Messrs. Paterson, Photolith., 1874. STUART, *Essay on Scottish Antiq.*, 4to., 1846. WHITE, *Archæol. Sketches; district of Kintyre*, 1863; 1873.

SCOTT (SIR GEORGE GILBERT), R.A. (1861); F.S.A.; F.R.I.B.A., born 1811, at Gawcott, near Buckingham, became 1827 a pupil of J. Edmeston, and commenced practice *cir.* 1840 in partnership with W. B. Moffatt, a fellow student (this was dissolved about 1847). In 1840-41 he designed the Martyrs' Memorial, Oxford; 1842-44, S. Giles new church, Camberwell; 1842 gained the competition for S. Nicholas church, Hamburg, erected 1845-63; designed 1848-9 the cathedral at S. John's, Newfoundland; 1849 was appointed architect to the dean and chapter of Westminster abbey; 1854-8 designed S. George's church, Doncaster; 1855-69, Exeter College chapel, Oxford; 1859 competed for the Foreign Office, etc.; 1863-8 designed the Albert Memorial, Hyde Park; 1863-5, S. John's College chapel, Cambridge; 1864, infirmary at Leeds; town hall at Preston; and 1873-8 cathedral of S. Mary, Edinburgh. A more complete list from 1847, including designs, restorations, and reports on buildings, is given in *BUILDER Journal*, 1878, xxxvi, 343, 360, etc. He died suddenly 27 March 1878, aged 67, and was buried in Westminster abbey. A likeness of him was given in *BUILDER Journal*, 1869, p. 626; and a portrait was painted by G. Richmond, R.A., for the Royal Inst. of British Architects, he having been president 1873-75; and 1859 received the royal gold medal. Among the pupils during the period of the partnership *cir.* 1840-47 were—Edward Runsey, now at Melbourne; H. E. B. Coe; Richard Coad; R. Lamprell; C. W. Orford; C. Hynam; and E. Oliver. Later pupils were his two sons Geo. Gilbert and John Oldrid Scott; Alfred Bell; G. F. Bodley, A.R.A.; Thos. Garner; Geo. Newenham, died 1871 at S. Francesco; W. H. Crossland; J. T. Micklethwaite; G. Somers L. Clarke; C. J. Ferguson at Carlisle; C. Hodgson Fowler at Durham; Ralph Nevill; T. Graham Jackson; Albert Harts-horne; C. J. Stafford; E. F. Osborne; — Tinling; R. Rowden; W. J. Gillett; — Shears; W. Boyle; G. E. Street, R.A., from O. B. Carter of Winchester; W. S. Weatherley; — Barker; late C. Buckeridge at Oxford; Arthur Baker; W. J. Niven; T. G. Jackson at Oxford; E. R. Robson; Edw. Birchall; C. E. Powell; A. K. Potter; F. Garrard; H. T. Turner; G. E. Fuller at Aberdeen; F. E. Jones; W. H. Monckton at Adelaide; F. J. Robinson at Derby; A. W. K. Burder at Loughborough; W. B. Fassnidge at Uxbridge; E. B. Thompson at Newcastle; and others. Those for many years in his office were J. Drayton Wyatt; W. Jolley at Nottingham; R. J. Johnson at Newcastle; J. J. Stevenson; J. M. Peidie at Edinburgh; H. J. Austin at Lancaster; E. Hughes at Huddersfield; H. Walker at Leeds; J. Meiland; A. Bickerdike; C. R. Baker King; and others.

Besides the three presidential addresses and numerous contributions to the *BUILDER* and other Journals, he wrote *Plea for the faithful restoration of our ancient Churches*, 8vo., 1850. *Report on the Royal Monuments in Westminster Abbey*, fol., 1854. *Removal of the Architectural Museum*, 4to., 1857. *Remarks on Secular and Domestic Architecture, present and future*, 8vo., 1858. *Gleanings from Westminster Abbey*, read at R.I.B.A., 5 and 19 Dec. 1859; and published with additional remarks and papers, 8vo., 1861; 2nd edit., 1863. *Conservation of Ancient Architectural Monuments and Remains*, R.I.B.A., 6 Jan. 1862. *Report on Restoration of S. Alban's Abbey*, 8vo., 1871. *On Westminster Abbey*, R.I.B.A., 12 June 1872. *Guide to the Royal Architectural Museum*, 8vo., 1876. *Thorough Anti-restoration*, 8vo., 1877. *Lectures on the rise and development of Mediæval Arch.*, 8vo., 1879.

SCOTT (.....), with several assistants from Kelso, was employed by the bishop of Aberdeen in building S. Machar's cathedral about 1165. JAMIESON, *Hist.* GOULD, *Hist. of Freemasonry*, 1883, ii, 424.

SCOTT (JOHN), master of the masons at York cathedral 1827 to Dec. 1834, when he was killed. BROWNE, *York Cath.*, p. 323.

SCOTT (WILLIAM), of Arbroath, also a well-known builder and superintendent of Harbour works, designed for the Burgh school board, the Hill school, and the additions to the Abbey school, the Inverbrothock school, and the Parkhouse school, and

ARCH. PUB. SOC.

also erected them. He designed and built the new guildhall; the drill hall, and S. Mary's hall attached to S. Mary's Episcopal church. He built the Public Hall buildings; the Bank of Scotland branch office; S. Margaret's church; and the cemetery gate and lodge. He died 27 Sept. 1884.

SCOTT'S PATENT CEMENT; see SELENITIC LIME.

SCOUCHON; see SCUNCHEON, an angle.

SCOURER of synks. A term in an agreement dated 1536, wherein for 26s. 8d., and a red cloth coat yearly, John Wylkynson of Bishopsgate Street agrees to "scoure, clense, and substantially make clene all the synks belonging to the kitchens of the king's houses at Windsor, Richmond, Hampton Court, the More, Westminster, Greenwich, and Eltham, every quarter of the year one time yearly if he shall be required." GENTLEMAN'S MAGAZINE, 1813, lxxxiii, 427. MAZERSCOWRE.

"Scowracio" and "scowryng", used in 1488-9, are explained as the cleaning the gutter of a hedge and forming up the breast with the water removed, in SURTEES SOCIETY, *Finchale Priory*, 8vo., London, 1837, p. 446. Skorynge of a ditch, 1517; NICHOLS, *Illustrations, etc.*, 4to., Lond., 1797, p. 158.

SCOURING. The cleansing of a metal casting by plunging it into water acidulated by sulphuric or muriatic acid, but the process makes the surface rough and some of the metal is removed. If certain organic substances are added to the acid water, the scale of dirt and oxide are removed and the material unattacked. Elsner found that tar added to the acid water completely cleansed an iron casting, while another in the usual acid water was nearly dissolved. OXIDATION. PICKLING.

SCOURINGHOUSE. This is mentioned in the list of rooms and offices at Hengrave Hall, Suffolk, XVI cent., and was probably what is now called SCULLERY. "Pastory, Squelerye, and Sausery" are mentioned together *cir.* 1525, in CAMDEN SOCIETY, *Miscellany*, iii, 1855, p. xxv.

SCRABO STONE. A sandstone obtained from extensive quarries near Newtownards, in the county of Down in Ireland. It is very variable in quality, easily worked, but will not stand the weather, yet good stone can be obtained. It is in colour greenish grey, stone grey, reddish grey, or yellowish and greenish; it weighs from 123½ to 142 lb. per cubic foot when dry; the crushing weight of 1 inch cube varies from 2,240 to 10,570 lb. according to the quality; WILKINSON, *Geology, etc. of Ireland*, 8vo., Lond., 1845, p. 35, and App. No. 77, 78, 79, 80. BELFAST. One quality is called a red stone.

SCRAPER. A tool used by a plumber, made of a plate of steel in the form of an equilateral triangle, in the middle of the back of which is fixed an iron strig with a wood knob or handle at the other end. The plate on the side next the handle is flat, but on the other side the edges are ground off like a chisel, but very obtuse. It is used to lessen the edges of lead pipes before soldering. GREENING. 4.

SCRAPING WORK. PAINT, to remove. SCRATCHING. DRAG.

SCRAP IRON. Short imperfect pieces of finished bars of iron, cut up and again rolled into bars; or shingled and rolled like common puddled iron, a few rough bars being mixed in, which give it a strong compact quality.

SCRATCHING or SCORING. In plasterer's work, the wet coats should be scored with the end of a lath, not by the end of a trowel, because the smooth surface left by the trowel does not give sufficient key. 1.

SCRATCHWORK. The term used during the XVIII century, for the SCRAFFITO of the Italians. 4.

SCREED. A narrow strip, run in plaster by the plasterer, as a margin on each side of a "bay" of the first coat of plastering, to guide the straight-edge or screed in forming the floating coat smooth. FLOATING COAT. In mediæval work, the jambstones on the inside of an opening were usually left slightly projecting to receive the thin coat of plastering, and so formed screeds. The pierre-blue is used at Antwerp as screeds for floating the stucco of the brick parts of the buildings.

SCREEN or SKREEN (Fr. *claire*). A large rectangular sort of

sieve, made of boards and wire work, according to the size required, through which passes lime, sand, rubbish, or other coarse material. A support at the back holds the screen in an inclined position. For use in ordinary mortars the sand is passed through a screen so as to separate the larger particles and foreign matters; the screen is made of one-eighth of an inch wire, having three spaces to one inch including the wires; DONALDSON, *Stucco*, 1840, p. 167. SIEVE.

A rotary screen is a perforated metal tube revolving at an angle of 20 degrees and fed at the upper end, the fine particles pass through the perforations, the coarse materials fall out at the lower end.

R. R. R.

SCREEN (Ital. *tramezzo*; Fr. *clôture, grille, jubé, écran*; Ger. *schrage*); see ALTAR SCREEN; CANCELLUS; CHANCEL SCREEN; ENCLOSURE; GRILLE; JUBÉ; ORGAN SCREEN; PARCLOSE; PARIOLUS; PARTITION; REREDOSE; ROD SCREEN. A movable framework to keep off excess of light, heat, or cold. A separation, as a dwarf partition. In some modern works it forms a single open colonnade admitting a view through it, as formerly in front of Carlton house, Pall Mall; and now to Grosvenor house, Hyde Park; Sion house, Middlesex; Hyde Park Corner; the Admiralty, and elsewhere.

In ecclesiastic buildings, it is a partition of wood, stone, or metal, to separate the choir from the nave, the aisle from the choir, and so on. The choir or organ screen in Canterbury cathedral, xiii cent., and that in York cathedral, xv cent., are amongst the finest examples in England. A stone screen in a parish church is of uncommon occurrence, as stated by FREEMAN, referring to the one at Compton Duntton, Somersetshire, which he stated was "evidently coeval with the chancel arch" and he only knew of two or three instances: this one "was of an amazing thickness"; BUILDING NEWS *Journal*, 1859, v, 883. The altar screen or reredose in S. Saviour's church, Southwark, is the least elaborate of four of the same general idea, the earliest being at Christchurch, Hampshire; a larger one at S. Alban's, and the largest and richest in Winchester cathedral.

The iron screen to the tomb of king Edward IV (died 1485) in S. George's chapel, Windsor, is said to be by Quentin Matsys (WYATT, *Metalwork*, fol. 1852, pl. 29 and 38). That around the tomb of king Henry VII and his queen, in Westminster abbey, cir. 1520; SCOTT, *Gleanings*, etc., 8vo., London, 2nd edit., 1863. In the church of Sta. Croce at Florence, 1371 (also in WYATT, pl. 2). A bronze grille xv cent. to a chapel in the cathedral at Barcelona (*Moyen Age Monumentale*, pl. 395); in the church of Notre Dame at Aachen, 4 pl.; in church of S. Aventin; cathedral of Orvieto; church of Langeac; are all figured in GAILHABAUD, *L'Architecture*, etc., fol., Paris, 1854, iv. Of oak in Ely cathedral; of brass at Lichfield; of iron with admixture of brass at Hereford; of wood, iron, brass, and marble at Worcester; all designed by G. G. Scott, R.A. COLLING, *Gothic Ornaments*, 4to., London (1848-50); GUENEAULT, *Diet.*, s.v. *Clôture* and *Ecran*; VIOLET LE DUC, *Diet.*, s.v. *Clôture*. *Illustrations*, pl. 229, 230; 144, 145; 113; 177; i, 1863-65; ii, 1863-65. Bronze gates, etc., in Burgos cathedral, in Spanish government work, lar. fol.

1. 14. 17. 19.

The CHURCH BUILDER *Journal*, 1877, p. 92, records the difference of sound in a church after a screen had been put up.

HALL SCREEN; as at Inner Temple hall; Leathersellers' hall, destroyed 1799; Falkland palace, 1550; SMALL, *Scottish Woodwork*, 4to., Edinb., 1878, pl. 96-100.

SCREEN (Fr. *clôture*). The term suggested s.v. CANCELLUS for the Indian perforated stone work; NESBITT, in *ARCHÆOLOGIA*, 1860, xl, pt. 1, p. 193-6; pierced slabs intended as parts of windows and those which may also have formed parts of inclosures of choirs, fronts of altars, and the like. GRATE.

SCREEN WALL. A wall serving to retain the earth of a bank behind it. It is often decorated, and with cavities for grottoes, etc.; or niches for statues or fountains, as in the gardens of the Crystal palace at Sydenham. A good example in the gardens of the villa Doria-Pamfili at Rome, about 65 ft. long, is given

Illustrations, s.v., pt. i, 1849-50, plate xxxv. This plate also shows a screen wall of the garden of the palazzo Doria, by Valvasori.

The term is also given to a wall next the pavement in front of the courtyard of a house, as to Montague house, Bloomsbury; Burlington house, Piccadilly, both removed; and to Harcourt house, Cavendish Square. A wall carried up midway between columns, as in the front of an Egyptian temple.

SCREW (Dutch *screwce*). One of the mechanical powers. In the "fullonica" at Pompeii, is a representation of a clothes press worked by two screws, the threads being wide apart. BENCH SCREW. CLAMP.

The screw or wood-screw (Scot. screw nail) now commonly used by carpenters and joiners is of modern origin, later than the Roman period. It consists of a spiral thread round a cylinder, the head being flattened, and a groove or slot or nick cut in it for the insertion of a tool called a "screwdriver", by which it is forced round into the material, or withdrawn. It is employed mostly to secure parts permanently together. The time when the flat head with a nick superseded the square head is not known. A screw with a solid head and secured at the other end by a nut, is usually called a BOLT. Improved wood screw, by H. Titus of New York, to countersink its own head; cut in BUILDING NEWS *Journal*, 1867, xiv, 6. The patent ginulet-pointed steel screws were manufactured by the Manchester steel screw company in 1879. MARTIN, *Screw Cutter's Guide*, 18mo.; SHEDDEN, *Screw Cutting, Boring, and Turning*, 12mo., 1872; MARTIN, *Screw Cutting Tables*, 2nd edit., 1874; LORD LINDSAY, *Screw Cutting Tables*, 8vo., 1878; *Screw Cutting Tables—Slide Lathes*, 8vo., 1872; WHITWORTH, *On a uniform system of Screw Threads*, read at INST. OF CIVIL ENGINEERS, June 15, 1841, *Proceedings*, p. 157-160, where the credit of the first attempt to introduce uniformity was claimed for Maudslay. ADHESION. A "screw cutting machine" is given in BUCHANAN, *Millwork*, 8vo. and fol., London, 1841, pl. 38; and pl. 7-9, p. 11, of Suppl. 1842 is Macleay and March's screwing machine. GILL, in *Technological Repository*, vi, 289.

14.

SCREW BOARD or SIDE BOARD. The verticle board (L) at the side of a carpenter's bench pierced with holes (D D) ranged at different heights in diagonal directions, which admit of pins (c) for holding up the object to be planed, which is supported at the other end of it by a screw (x) and screw-check (H), together called the *bench screw*, acting like a vice. The letters refer to the woodcut s.v. BENCH.

SCREW DRIVER. A tool of various lengths and sizes used by workpeople for driving screws into wood or other material. The force applied in screwing by short or long drivers is explained in CIVIL ENGINEER, ETC., *Journal*, 1849, xii, 62. ADHESION. The mechanical advantage of the screw to overcome resistance is as the circumference to the pitch or distance between two consecutive threads; but the screw is seldom applied without the aid of a lever; hence the circle described by the lever where the power is applied is taken for, or instead of, the circumference of the screw. TEMPLETON, *Engineer's Pocket Book* for 1884, p. 85, gives rules for finding the amount of resistance.

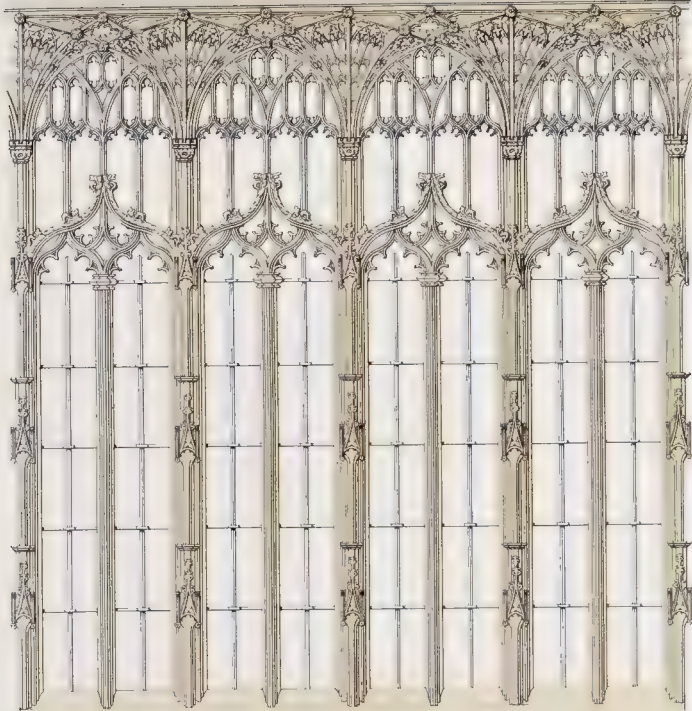
SCREWING UP a wall or building; see RAISING and PERPENDICULAR.

14.

SCREWJACK; see JACK. Screws are frequently used instead of wedges for adjusting centres and other work. BENCH SCREW. CLAMP. England's patent universal screwjack for raising and moving heavy weights, and Curtis's traversing screwjack, are described in *Proceedings* of INST. OF CIVIL ENGINEERS, 12th May 1840, p. 60; and SURVEYOR, ENGINEER, ETC., *Journal*, 1840, i, 83; and p. 111, Curtis's traversing screwjack.

SCREW PILE for submarine foundations, by Mitchell's patent screw moorings. CYLINDER. FOUNDATION. PILE (p. 112); CIVIL ENGINEER, ETC., *Journal*, 1837, i, 22; 1844, vii, 68, 293; xi, 122; xii, 35; xx, 141; xxv, 216. BUILDING NEWS *Journal*,

SCREEN



This picture covered with Woodwork of Modern Work



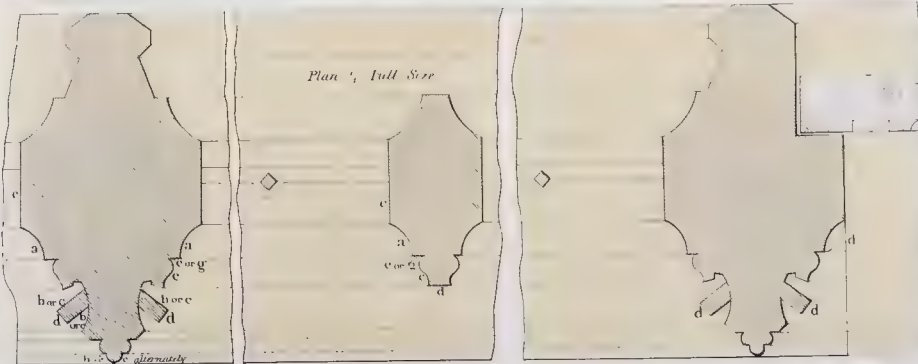
Elevation C D. see Plate Plate N° 1



MA
Plate N° 2

References to
a. White
b. Blue
c. Red
d. Gold
e. Green
f. Black
g. Brown

Sheet
F 1



Plan 'a' full size

Measured and Drawn by C. F. Hayward M.R.I.A. and A. Hughes

Lithographed for the Society by Kell, Bro^s July, 1865

SCREEN.



NORTH SCREEN
FACING
NORTH AISLE

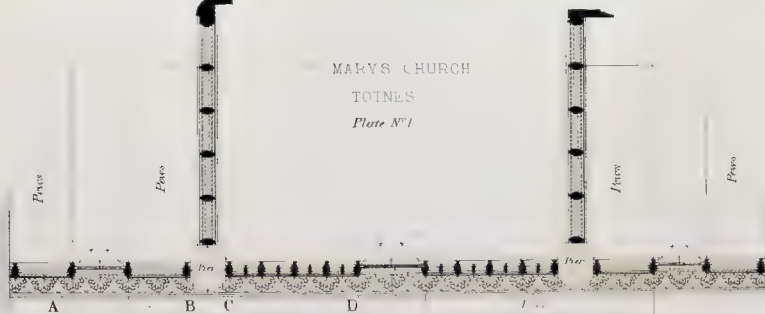


Octagonal Staircase
to Roof

Elevation. A B E

Section E. F

MARYS CHURCH
TOINES
Plate N°1

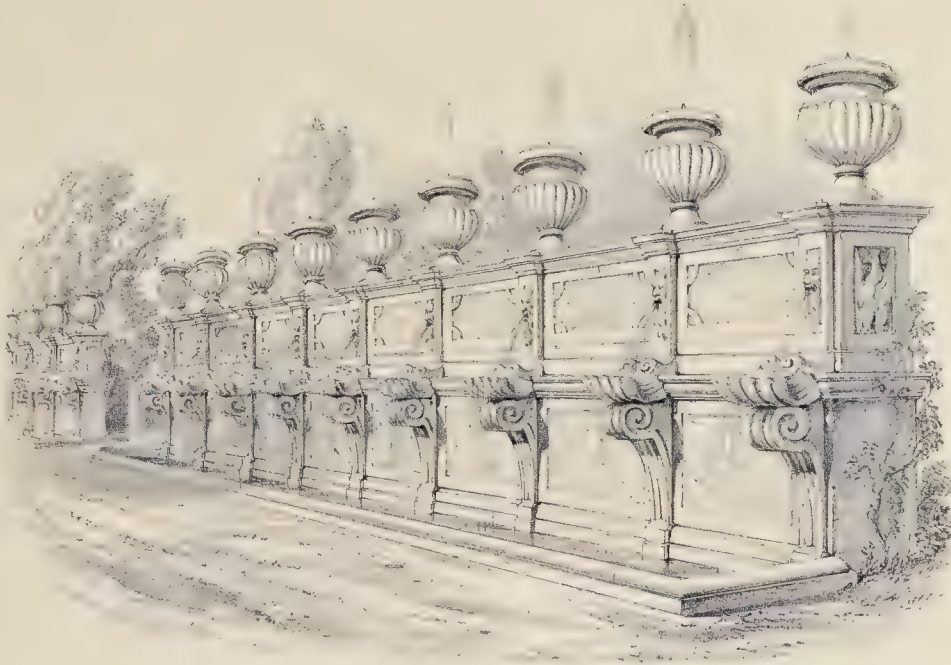


Measured & Drawn by C. P. Hayward M.R.I.B.A. and A. L. Lupton

Lithographed for the Society by Kells Bros. July, 1865

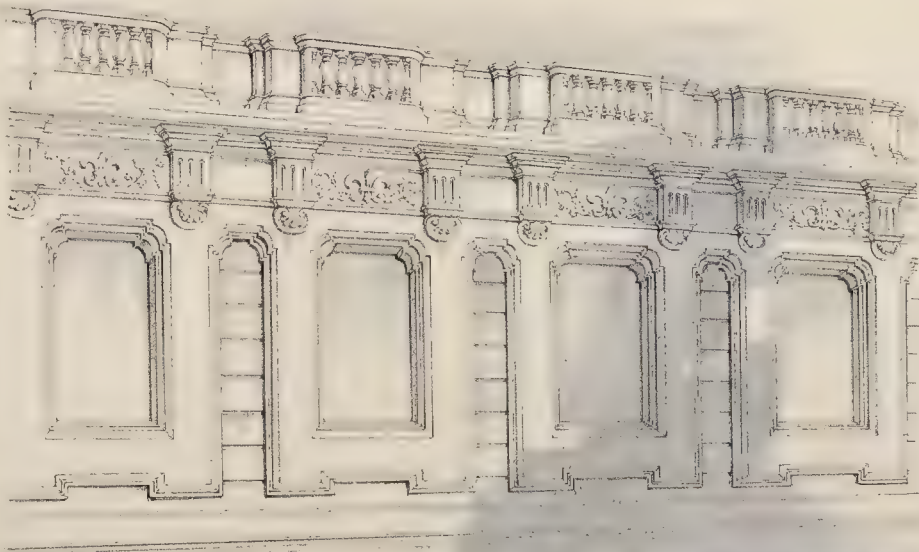


SCREEN WALL



ROME.
VILLA DORIA PAMFILI

Charles Fowler, Junr

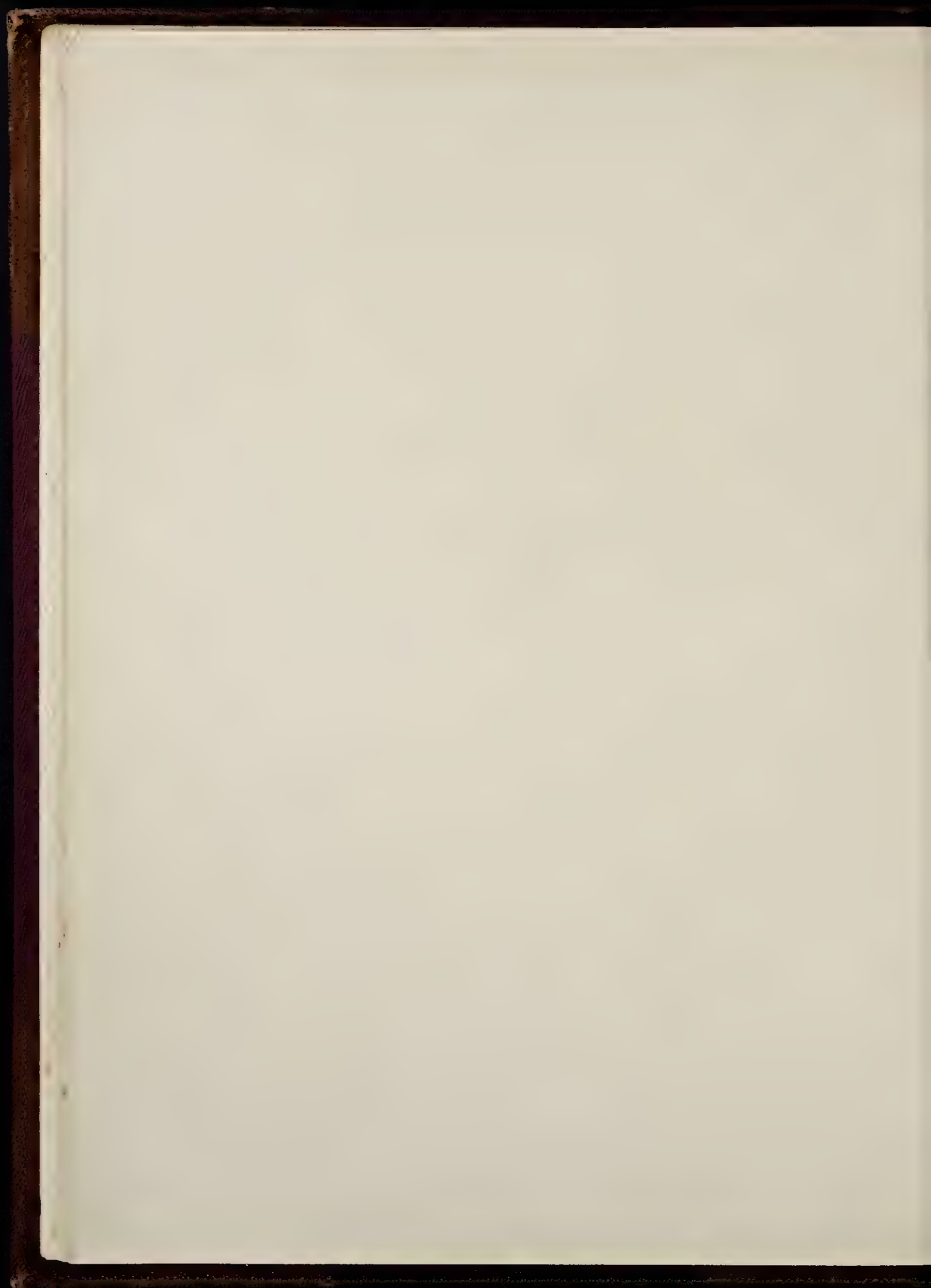


ROME.
PALAZZO DORIA

Via del Corso.

T. B. Lewis, M. B. A.

Lithographed by Messrs. "Dagb. Son. Jan." 28th 1850



1868, xv, 115; xviii, 209; *Annales de la Construction*, fol., Paris, 1855, i, 49, 53-4. FOWKE, *Report*, 1857.

SCRIBBLED ORNAMENT. A Norman decoration so called in KING, *Monimenta Antiqua*, fol., London, 1806, iv, 84, pl. 5, ex. 24. Mr. Smirke saw similar rough ornamentation on the door-jamb of a small early Norman church, called La Nunziatella, at the southern extremity of Messina; *BUILDER Journal*, 1860, xviii, 715.

SCRIBE. A tool used for marking timber, packing cases, and other wood articles by the customs officers, and valuers. Townsend's timber scribes 1833 are still much used (1880).

SCRIBE. When a joiner is to fit a side of a piece of stuff against the side of some other piece of stuff, the side of which is of a somewhat irregular form, he, in order to join them together, "scribe it" as is said, by laying the two pieces together, and by the compasses tracing the irregular form on the piece to be cut, which is then cut away exactly to the line drawn; and the two put together they form a joint; MOXON, *Mechanick Exercises*, 4to., London, 1677, p. 12. The skirting of a room is "scribed to the floor".

SCRIBING. The act of fitting one piece of wood upon another, so that the fibres of both may be perpendicular to each other, and the end cut away across the fibres, so as to fit upon the side of the other. This method is used in doors and sashes, when it can be done; but in quirked mouldings, recourse must be had to mitring.

SCRIPTORIUM. The room or place in the mediæval monastery where persons were employed in transcribing manuscripts. It was usually in the cloister or adjoining the church; or in the second cloister. This room in a Cistercian abbey was placed over the chapter house, as part of the library. No instance is known where this chamber is preserved entire; at Ely, Furness, and Fountains, its wall and windows are left. At Brombach and some other foreign abbeys, it has been rebuilt: SHARPE, *Architecture of the Cistercians*, in *ROY. INST. OF BRIT. ARCHITECTS*, 1870-71, p. 200. The precentor had the charge and furnished materials to the *librarii* who made new books, and the *antiquarii* who copied or repaired the old books. WYATT, *Illuminated Manuscripts*, *idem*, 1860; LENOIR, ii, 374; FOSBROOKE, *Brit. Mon.*, ch. xlv; WALCOTT, *Conventual Arrangement*, 8vo., London, 1861, p. 115, 121. CARRELL.

SCRIPULA. A Roman measure of length, being a hundredth part of the actus quadratus, or major, which contained 14,400 square feet. ACTUS. SMITH, *Dict. of Geog.*, s.v. Agriculture.

SCRIVA or SCRIVANO (LUIGI PIRRO, or Pirro Luigi) of Spain, a knight of Malta, so expert in civil and military architecture that he was deputed 1534 by Charles V to construct the new castle of Aquila, near Naples; it comprised four large towers between which are the curtains 24 ft. thick, surrounded by a ditch 70 ft. wide and 40 ft. deep; and was considered at the time a prodigy of strength. He also planned 1532-54 the castle Sant' Erasmo or Elmo, at Naples (also attributed to P. de Prado, or de Prata).

SCROGG. A term used in the West Riding of Yorkshire for a stunted tree. *ARCHÆOLOGIA*, xvii, 156.

SCROLL (Fr. *enroulement*). A convolved or spiral ornament. Also the volute of the capital used in the Ionic and Corinthian orders of architecture. Also the termination of the handrail of a staircase at the top of a newel. Also the wave-like form usually called VITRUVIAN SCROLL. C. R. SMITH, *Red-glazed Pottery of the Romans* (Samian ware), in *Journal of the BRIT. ARCH. ASSOCIATION*, 8vo., London, 1849, iv, gives a plate of nine varieties of scrolls found on that ware. LEGEND. SCROLL.

MOXON, *Mechanick Exercises* Bricklayer, 4to., London, 1700, p. 45, describes the hot and cold cement for cementing bricks with a fine joint, for carving scrolls and capitals in brickwork.

SCROSATO (GIULIANO), was employed 17 Dec. 1391 to 26 March 1401, at the duomo at Milan.

SCUDIERI (...). A young Milanese architect, who had erected thirty-four important buildings in the Caucasus, and

the theatre begun 1849 at Tiflis, was killed with fifty-two workmen 4 August 1851 while directing the construction of a new church in the same town, by the falling in of the dome.

SCULL; see BUCRANIUM; BULL'S HEAD; HEAD. OX.

SCULLERY. The place for cleaning dishes and pots, and for preparing vegetables, fish, game, etc., for the kitchen. It should communicate direct with the kitchen, and its door be as near the fireplace as can be managed, leaving sufficient space for the operations of the cook. Good light, ventilation, coolness, and dryness are essential. A door leading into the open air, and placed near the kitchen, would also give access to the coal, and wood-house, ash-bin, and also for various outdoor cleansing purposes. A copper for cleansing, copper for vegetables, a small cooking range to assist the one in the kitchen or for smaller use; sinks and washers, with hot and cold water laid on; dresser, plate rack, and dripboard, are also usually supplied in large houses. Its arrangement and position are shown *s.v.* Kitchen. PLATE SCULLERY. SCOURING HOUSE. I.

SCULPTOR; also called CARVER, and STATUARY. One who carves in wood, stone, or other material; who executes the finer or artistic portion of decoration in contradistinction to the MASON who only dresses stone or does moulded work.

List of Sculptors is given in SILLIG, *Catologue*, etc., trans. by WILLIAMS, 8vo., London, 1836. WALPOLE, *Anecdotes*, etc., 8vo., Wornum's edit., 1862. A list and of works in ELMES, *Dict. of the Fine Arts*, 8vo., 1826. *Sculpture in England as applied to Sep. Mon.*, in *GENTLEMAN'S MAGAZINE*, 1818, lxxxviii, 489; 595. *The Sculptor's Art*, as to likeness and resemblance, by Sir F. CHANTREY, in *MACREADY, Reminiscences*, 8vo., 1875, i, 396. *Sculptor's house*, *BUILDER Journal*, 1858, xvi, 519. ACKERMANN, *Repository of Arts*, 8vo., London, 1816, 2nd ser., gives *List of Sculptors and works*, i, 69-72; 131-4. 1. 4. 6. 8. 14. 19. 25.

1341-2. F. Clifford, *Sculptenti capitania*, at Exeter cathedral; OLIVER, *Exeter Cath.*, 8vo., Exeter, 1861, p. 384.

xiii cent. *Sculptores lapidum*; WRIGHT, *Vocabularies*, 8vo., London, 1857, i, 294.

xiv cent. The tools and bench are given in TURNER AND PARKER, *Domestic Arch.*, 8vo., Oxford, 1859, iii, 141.

1419. Contract for a tomb by T. Prentys and R. Sutton, of Chelaston, co. Derby, "kervers."

SCULPTURE. The art of carving in wood, stone, or other material. TOMB. POLYCHROMY. TERRA COTTA. ORNAMENT. WOOD-CARVING. LEAFAGE. The tomb of Aylwin, died 993, in Romsey abbey church, is supposed to be the oldest piece of sculpture in England, since the Roman period.

ADAM, *Recueil de Sculp.*, *Grecian and Roman*, fol., 1754. CARTER, *Specimens of Ancient (Med.) Sculpture and Painting in England*, fol., 1780; 1838. CUMBERLAND, *Thoughts on Outline Sculpture*, 4to., 1796. TATHAM, *Etchings of Fragments*, fol., 1806; *Etchings of Ancient Orn. Arch.*, fol., 1799. DAVID, *Recherches sur l'Art Statuaire*, etc., 8vo., 1805. SOCIETY OF DILETTANTE, *Specimens of Ancient Sculpture, Egyptian, Etruscan, Greek and Roman*, fol., 1809-35. D'AGINCOURT, *Histoire de l'Art par les Monuments*, fol., 3 vols., Paris, 1811-23; and London, 1847. VAUTHIER AND LACOUR, *Monumens del Sculp.*, *anciens et modernes*, fol., 1812. DALLAWAY, *Statuary and Sculpture among the Ancients*, 8vo., 1816. VULLIAMY, *Examples of Ornamental Sculpture*, 4to. (cir. 1825). CICOGNARA, *Storia della Scultura*, fol., 1823, etc. CUNNINGHAM, *Outlines from Greek and Roman Sculptures*, 4to., 1829. FLAXMAN, *Lectures on Sculpture*, 8vo., 1838. JAMESON, *Handbook to the Courts of Modern Sculpture at Crystal Palace*, 12mo., 1854. PERKINS, *Tuscan Sculptors; Lives, Works, and Times*, 8vo., 1865; *Italian Sculptors*, 8vo., 1869. WESTMACOTT, *Lectures at Royal Institution*, 1869. PERRY, *Greek and Roman Sculpture*, etc., 8vo. In *Gold and Ivory*, *BUILDING NEWS Journal*, 1879, xxxvi, 503. DALY, *Revue Générale*, Index. *BUILDING NEWS Journal*, 1873, x, with many plates. C. H. SMITH, *Mechanical Processes of S.*, 1851. 14.

SCULPTURE GALLERY. A large apartment specially designed for the exhibition of works of sculpture.

	Foot long.	Wide.	High.
(Last-would.)	1.65	30	2.1
Woburn, 1789, H. Holland . . .	136	25	22.7; 30 ft. in middle.

The British museum; the Towneley gallery 1810 by Geo. Saunders was removed about 1851; PARWORTH, *Select Views*, 8vo., London, 1816, p. 74. Arundelian marbles at Oxford. Fitzwilliam museum and the new gallery at Cambridge. South Kensington museum; COMPANION TO THE ALMANACK, 1885, p. 146; 161. Royal Architectural museum, Westminster. Edinburgh. Florence. Munich, the Glyptothek about 220 square around a court. Berlin. Rome. Paris.

SCUNCHEON, Sconcheon, Scuntion, Scuntin, Skunchion, and Skonchon, Skownsiom. The bevelled parts, splays, elbows, or jambs of the inside of an opening, where the shutters are placed. "It was probably originally applied to the angle formed by the meeting of the planes of the window jamb and wall of a room (QUOIN), but is now used to denote the whole side of any aperture"; *BUILDER Journal*, 1868, xxv, 948. "Scouchon" is used in the Agreement for the steeple of Fotheringhay church, 13 Henry VI. 16. 17. 19.

SCUNE (CHRISTOPHER), 1505-6 to 1515 with Lawrence and William, succeeded John Cole, the master mason, i.e., architect, of the stone spire of Louth church, Lincolnshire. The *ARCHAEOLOGIA*, x, 80-2, shows that Scune was paid 10s. for half a year and at Easter 10s. more in a reward. On p. 85 the "master" appears to have left for "the north country" and to Boston, leaving the work incomplete. A Christopher Scune is also mentioned as a apprentice.

SCUNTIN. See SCUNCHEON.

SCUPPER NAIL. A nail used principally for fastening leather and canvas to wood, and having a broad head that neither may work out. 4.

SCUROLO The Ital. name for a crypt, as at Piacenza, and Modena.

SCUTABLE. A term occurring in the passage "pieces of Caen stone wrought for scutables for the new alure" in the Accounts 4-6th Edward III relating to S. Stephen's chapel, Westminster, and supposed to denote escutcheons or shields for the front of the gallery. SMITH, *Antiq. of Westminster*, 4to., London, 1807, p. 207. 19.

SCUTARIUS. An officer, which may perhaps be the same as the "Scutellarius", who was charged to deliver the *scutellus* in his care to the novice on taking possession of his cell. *Chron. Mon. Abingdon*, edit. by STEVENSON, in the Rolls series, ii, 322; and ii, 339. NOTES and QUERIES *Journal*, 4 Ser., ix, 524.

SCUTARIUS. An architect and senator of Rome, who was sent by pope Gregory (?), with Evodius, the first bishop of Le Puy, in Auvergne, at the end of VI century, to assist the bishop in building the church. The tombstone of Scutarius is still to be seen near the transept door. STREET, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1860-61, p. 98.

SCUTCHEON, Scouchon, Scoutcheon, Escoccheon, or ESCUTCHEON. A shield for armorial bearings. "Scutcheon" is used in the contracts for the tomb in the Beauchamp chapel, Warwick; and in will 1477 of Richard Foulter; NICOLAS, *Test. Vet.*, p. 344. Also, a plate to the ring or keyhole of a door, as an ornament. It may be circular, cruciform, or rose-shaped, and pierced as thickly as possible. *ECCLESIOLOGIST Journal*, 1849, ix, 359. SCUNCHEON. 17.

SCUTCHING. The finished face, principally done to coursed rubble walling around Liverpool, when of the new red sandstone or other softish stone, the coins and dressings being hewn stone tool-faced. The rubble work is usually of 8 in. to 10 in. courses, is extensively employed in fence walling, and when properly bonded with sufficient through stones it makes very good work. The face is worked by a "scutching hammer" having three or four bits, which leaves the marks in parallel lines, and is a good and cheap mode of working. BIT HAMMER. BRETTURE. DIAMOND HAMMER.

SCUTLAGIUM. A small close or enclosure, as a garden, 1264; in SURTEES SOCIETY, *Finchale Priory*, 8vo., London, 1837, p. 124, 446.

SCUTULA. A tile cut into a certain shape; VITRUVIUS, VII, i. AQUINO, *Vocab. Arch. Edif.*, 4to., Rome, 1734, p. 88-9, s.v. Favi.

SCYRIUM MARMOR. A name given by the ancients sometimes to a white, and sometimes to a yellowish marble; both used in the public buildings of the Romans, but seldom for statuary, it not being capable of a high polish.

SCYTHOPOLIS. The Greek name for Bisan, Beisan, or Byzan, the BETHSAN of the Scriptures, in Syria; the largest city of the Decapolis. The outline of the theatre is still quite distinct. W. J. Banks is stated to have discovered seven recesses, being a very complete example of the *echœia* (ECHÆIUM) chambers; with a gallery affording access to each chamber for the purpose of arranging and modulating the vases; IRBY AND MANGLES, *Travels*, 8vo., London, 1823; STUART AND REVETT, *Antiq. of Athens*, fol., London, 1830, iv, 40, note; ROBINSON, *Biblical Researches*, 3rd edit., 8vo., London, 1867, iii, 327-32. CONDER, in *Memoirs of Western Palestine*, by Palestine Exploration Fund, 1882, ii, 101, etc., with plan and views. 28.

SEABROKE (THOMAS); see SEBROKE (T.).

SEA (GREEN, or VERD DE MER MARBLE. A modern 1777 marble obtained from near Carrara, on the side of Genoa. It is a very clear green with white veins. Four columns of the Ionic order in the Carmelite church in the faubourg S. Jacques, at Paris, are specimens.

SEA HORSE. A fabulous animal having the forequarters and body of a horse, but ending in the tail of a fish. A symbol of Poseidon. The idea of the *hippocampus* was probably suggested by the singular fish of that name, which abounds in the Mediterranean, and which resembles a horse's head and neck placed on a fish's tail. In Etruscan art the sea horse is rarely depicted on walls, but sculptured on sarcophagi and urns; and is regarded as emblematic of the passage of the soul from one state of existence to another; DENNIS, *Etruria*, 8vo., Lond., 1848, i, 220, 329; ii, 37, 184, 345. *Pittura d' Ercolano*, fol., Nap., 1762, iii, 85-93. INGHIRAMI, *Mon. Etruschi*, 4to., Fiesole, 1821-6, vi, pl. D, 2 and 3. 59. 79.

SEAL or table. The technical term for the stone slab of an altar. *ECCLESIOLOGIST Journal*, Sept. 1843, iii, 6.

SEALING; see SEELING. Also the fixing a piece of wood or iron in a wall with plaster, mortar, cement, lead, or other solid bindings; 1736. 4.

SEAM. In mining is a horse load. BRES, *Glossary*.

SEAM. A quantity of glass=24 stone of 5 lb. = 120 lb.; CHAMBERS, *Cyclo*, s.v. WILLIS, *Arch. Nomen*, 1844. *Seam*, in *Statutes at Large*, fol., 1810, i, 204. *Seme*, in SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Dur., 1859, p. 352. BROWNE, *York Cathedral*, 4to., London, 1838-47, p. 251-2. PAIS' is a smaller measure.

A Seme of lime 1517 was 2s.; three bushels costing 9d., Churchwardens Accounts of Heybridge, Essex, in NICHOLS, *Illustrations, etc., of England*, 4to., London, 1797, p. 158-9.

SEAM. Plumbers in forming a platform of lead (1736) formed a seam by first making the "stander" and the "orlop", then bringing them together, turn the orlop over the stander by the help of the "dresser" and "seaming mallet", reducing them into as little room as possible by wrapping them one into another, until it forms a kind of semicircle. Another kind of seam is the roll. LEADWORK. ROLL. GOODMAN, *On Leadwork*; *BUILDER Journal*, 1862, xx, 319. 1. 4.

SEAM (Fr. *bavure*) or mould mark. The little projection on a cast, being the joint caused by the parts of the moulds in casting. Many artists prefer to see them as showing that the cast has not been touched up.

SEAMER or SEMERK (EDWARD), 1480-99, is called "master-mason of S. George's chapel at Windsor, with wages at per day 1s.", by DALLAWAY, *Discoveries*, 8vo., London, 1833, p. 423. He was warden of the works, or warden of the masons, as in the contract for the vaulting. SEMERK (H.).

SEAMING MALLET. An instrument of holly or other

hard wood, wrought away from the middle to one end, almost to a sharp edge, and the same at the other end, only those edges stand at cross angles to each other, like a cross mattock, and in the middle of it is a handle like a mallet.

SEA SALT. A chloride of sodium; in the proportion in which it exists in seawater, it will slowly decompose the silicate of potash contained in cement and leave the siliceous free. It generally retards the setting of mortar and cement; the salts of magnesia exert but little action on free lime, or on the aluminate of lime; French Academy of Sciences; in *BUILDER Journal*, 1856, xiv, 643. A discussion is printed in *CLERK OF THE WORKS Journal*, Dec. 1884 and Jan. 1885.

SEA SAND; see **SAND**.

SEASONING TIMBER. A process of preparing timber without the use of means for its preservation. A slow fermentation heating the natural or acquired moisture, which expands in steam, and is absorbed by the atmosphere, and at last no moisture is left; it may be carried so far by alternation as to be nearly ready to burst into flame. The Romans cut half through the trunk of the oak (*QUERCUS*) in the spring and felled in December. This system was long followed, and is still so in the Forest of Dean. *EVELYN* wanted the oak to be barked in the spring, but November or December is a better time. Barking for tanners, introduced felling in spring. *HUSSEY, British Mycology*, 4to., London, 1847-54, i, Merulius, pl. 3. *ELLIS, Timber Tree Improved*, 1738, p. 11, 52.

The natural juices of the tree must be got rid of by seasoning in order that the wood may become dry and hard. After being felled, the timber is left for some time exposed to the weather, called "natural seasoning"; may be soaked in fresh running water, so as to dilute and wash out the juices, called "water seasoning", but this leaves the timber "water soaked"; or boiled or steamed. When taken out of the water, the timber is left to dry thoroughly, by being blocked up from the ground so as to have free circulation of air. When cut into boards they should be piled one upon the other with wood fillets between each; sometimes they are laid in a triangular form with the ends alternating, for the fresh air to circulate. The two systems in vogue, *cir.* 1700, are described in *MOXON, Mechanick Exercises*, 4to., London, 1694, p. 151-2. Thin pieces will be seasoned in about a year; thick wood in three or four years; after which they may be removed into the **DRYING CLOSET** or stove-heated room. In the stacking of timber the pile should be well raised from the ground for circulation of air. The drying of timber should be gradual, for if rapid it suffers a loss in toughness as well as in pliability; the pores at and near the surface become contracted and prevent the interior moisture from escaping. The timber should be dry before it is cut into planks or they will be liable to warp and shrink. By the use of kilns timber can be seasoned in one-third the time taken by air drying. Oak loses nearly two-fifths of its weight by seasoning. About four hours is said to be sufficient for *steaming* the largest sized pieces. *WYLLSON, Timber, its Treatment and Uses; BUILDER Journal*, 1844, ii, 360, etc.

1. Bentham's "seasoning house" as used by the Admiralty, is described in *CIVIL ENGINEER, ETC., Journal*, 1855, xviii, 235. P. W. Barlow patented April 18, 1856, the use of compressed cold or heated air, driven through the stick; driving out the sap and any liquid used of a preservative character; *CIVIL ENGINEER, ETC., Journal*, xix, 422. Davison and Symington's patent process exposes the timber to a rapid and continuous current of heated air so that it becomes thoroughly dry (*Reports of the Juries*, 1851, 8vo., p. 122). MacNeile Brothers' new system, 1877, consists in exposing wood to a moderate heat (about 110° Fahr.) in a moist atmosphere, charged with carbonic acid gas and the various hydrocarbons produced by the combustion of fuel. The results as stated are:—sound wood is not warped or twisted, shakes previously existing are not increased, the strength is not deteriorated, wood can be dried to any extent required, is rendered denser and somewhat harder, and hence less liable

ARCH. PUB. SOC.

afterwards to absorb moisture. The whole of the surface may be taken off at any subsequent period without shrinkage. Three-inch planks of oak, ash, mahogany, and other hard wood, take about eight weeks; three-inch deals rather less than a month; flooring boards and panelling about ten to fourteen days. **DRYING STOVE.** **DESSICATION.** **PRESERVATION** and its references.

SEASONS; THE. On one of the three inner archivolt of the great central entrance of S. Mark's, at Venice, are carved figures of the months separated into two groups by a figure of the youthful Christ in the centre. Each is minutely described by *RUSKIN, Stones of Venice*, 8vo., Lond., 2nd edit., 1867, ii, 272-5, who, 276, gives "a parallel view of the employment of the months from some Northern manuscripts. A series nearly similar to that of S. Mark's, occurs on the door of Lucca cathedral; and on that of the baptistery at Pisa. In all cases the figures are treated with the peculiar spirit of the Gothic sculptors; and this archivolt is the first expression of that spirit which is to be found in Venice." The seasons, etc., are also described as represented by artists and poets, quoting *SPENSER, Faery Queene*, in *ELMES, Dict. of the Fine Arts*, 8vo., London, 1826.

6. **SEAT.** The name given to the residence in the country occupied by nobility and gentry. *WATTS*, 1779; *HAVELL*, 1815, etc.; *NEALE*, Two Series, 1822-32; *JONES* (reprint), 1829, etc. *LOUDON, Encyclo. of Gardening*, 1824; 1850. *CAMPBELL, WOOLFE, AND GANDON, and RICHARDSON*, Three Series, fol., 1715, 1767, 1802; *ADAM*, 1720-40. *PAINE*, 1783.

SEAT (Anc. *siege*, from the Fr. *siege*). The name of anything serving as a resting-place to sit upon. **BENCH**; **BENCH END**; **BENCH TABLE STONE**; **CARREL**; **CHANCEL BENCH**; **FORM**; **PRW**; **MISEERE**; **SEDILIA**; **STALL**; **SUBSELLIUM**; **THRONE**.

A circular stone at the base of the Early English pillars in the church of S. Lawrence, Aylesby, Lincolnshire, was used by the aged and infirm, constituting the only permanent seating usually then thought necessary, the general congregation either standing or kneeling during the service; *ASSOCIATED SOCIETIES, Reports and Papers*, 1878, p. 160. Seats in Stanford church, Leicestershire, are placed choirwise; *Reports and Papers*, 1883, p. 131. The bishop's order—getting the pews uniform in S. Michael's church, Chester, 1634—directs "to make the seats in the chancel chancelwise and to remove all other seats out of the chancell". *Right to Seats and Allotment thereof, CHURCH BUILDER Journal*, 1868, p. 23-7. *Clarke*, on *Episcopal Chairs and Stone Seats, etc.*; in *ARCHÆOLOGIA*, read 1793; xi, 1808, p. 317. *On Seating*, in *Modern Village Churches*, *ASSOCIATED SOCIETIES, Reports and Papers*, 8vo., Lincoln, 1873, p. 74. **SCHOOL FURNITURE.** *DRYDEN, Rules and Measures for Church Pews*, *ASSOCIATED SOCIETIES, Reports and Papers*, 8vo., Lincoln, 1866, p. 303-9. *Form and Dimensions of a Seat; BUILDER Journal*, 1862, xx, 496 with woodcut; 625. *Seats in Churches*, with the Incorporated Society's regulations and woodcuts; *CHURCH BUILDER Journal*, 1863, p. 162-8; *Children's Seats and Chairs*, 1864, p. 24; *Bench to shut up*, 1864, p. 29. Average size of over 20 examples from different parts of the country—3 ft. 2 ins. apart; 3 ft. 2 ins. height of standard, 1 ft. 6 ins. width of ditto, 1 ft. width of seat, 1 ft. 5 ins. height of seat, 2 ft. 10 ins. height of back; *BUILDER Journal*, 1851, ix, 623. A list of fourteen examples in Somersetshire is given in *ECCLESIOLOGIST Journal*, 1842, i, 104; and a further one 1843; reprinted in *CIVIL ENGINEER, ETC., Journal*, 1843, vi, 425. *DENISON, Lectures*, 8vo., 1856, p. 244. *EXETER DIOCESAN ARCHITECTURAL SOCIETY, Transactions*, 4to., Exeter, end of vol. i. *WHITE*, in *CHURCH BUILDER Journal* for 1884. "It were to be wished that there were no pews but benches. There is no stemming the tide of profit and advantage of pew-keepers;" *WREN, Parentalia*, fol., London, 1750, p. 321.

Chairs v. open Seats; BUILDER Journal, 1852, ix, 622-3; 1859, xvii, 428; 1862, xx, 239. *ECCLESIOLOGIST Journal*, 1842, i, 128. *Open Seats*, 1845, iv, 271. Amongst the many references to fixed, appropriated, and open seats, made by *WEBB, Conti-*

mental Ecclesiology, 8vo., London, 1848, he notices (p. 136) that in the private chapel of the hotel of the "Three Moors" at Augsburg, the open seat is so formed as to make a back each way; the standards have a kind of rail or back board revolving on a pivot, so that whichever way it is turned it makes a back. At the church de' Gesuiti, at Venice, a fixed seat facing west had a seat turned up by hinges, revealing a lower bench serving to kneel upon—of course eastward, the back of the sitting bench being the proper height to lean against.

SEAT. In ancient amphitheatres; the space allotted to each person; at Pola, it was about 14½ Eng. ins. as marked thereon: 18,000 seats were provided. At Pompeii, the seats were 15½ ins. for each person, as shown by the numbers and divisions still existent (28) in the great theatre, where the seat was about 1 ft. 3 ins. high and 2 ft. 4 ins. wide. The lowest range of seats in a Roman theatre was raised above the area of the orchestra one-sixth of its diameter; the height of each seat is directed not to exceed 1 ft. 4 ins., nor to be less than 1 ft. 3 ins.; the breadth is not to exceed 2 ft. 4 ins. nor to be less than 1 ft. 10 ins.

SEAT or SEATING of an iron column. The crushing and breaking of cast iron columns is often due to the improper seating. The common method is to take the column just as it comes from the foundry, set it up on a rough base, the open spaces being filled in with lead. This throws the whole weight upon the rough projections on the base. In course of time these projections are driven into the mass of the columns, and acting as wedges, force the granules of metal apart, accelerated by vibrations and sudden changes in the amount of load.—Fracture and accident occur. The proper manner is to have the base turned off true in a lathe, and the surface on which it rests should be dressed, so as to give an even bearing over the whole surface of contact; *BUILDING NEWS Journal*, 1870, xviii, 409.

SEAVES. The West Riding of Yorkshire term for rushes.

SEA WALL or REVETMENT. EMBANKMENT. RETAINING WALL. Harbour and QUAY WALL. A retaining wall erected along a line of coast adjoining the sea. It is now more usually constructed of concrete blocks or in layers or cases. **WAVE. BATTER.** A sea wall of peculiarly strong construction of the Leith branch of the Edinburgh and Dalkeith Railway, built 1837 by W. J. M. Rankine from designs by J. Walker. **RANKINE, Effect of Storm on Dec. 6, 1847, on Sea Walls**, read at INST. OF CIVIL ENGINEERS, 1849; *CIVIL ENGINEER, ETC., Journal*, xi, 123; 1849, xii, 265, (319 note). **DOUGLAS, Construction of Sea Walls**; Protest, etc., against the members of the Harbour of Refuge Commission, 13 Jan. 1846; *CIVIL ENGINEER, ETC., Journal*, 1847, x, 215; 251; 281-4. **RECLAIMING LAND FROM THE SEA, &c.** INDEX OF INSTITUTION OF CIVIL ENGINEERS. Other references *s.v.* RETAINING WALL.

SEA WATER. It contains, according to A. Marcet (1819), a double sulphate of potash and magnesia, hydrochlorate of ammonia and carbonate of lime; while a few other elements have been added. Chloride of sodium or common salt is the largest ingredient. 14.

Sea water differs much from fresh water in its effect on different kinds of mortar and cement, not only from the constant and often violent action of the tide and waves, but from the various salts, carbonic and frequently hydrosulphuric acid, held in solution; French Academy of Sciences; *BUILDER Journal*, 1856, xiv, 643. A double silicate of magnesia and alumina is capable of resisting sea water in béton when the same of alumina and lime would not answer, but magnesia is very dear; *CIVIL ENGINEER, ETC., Journal*, 1855, xviii, 218. Vicat Junr. showed that calcined magnesia added to a cement would resist the action of sulphate of magnesia, Kuhlmann mixed calcined dolomites with mortar with alkaline silicates—all these silicates strongly resist the action of sea water—and actually becoming more insoluble the longer they are in contact with it. 30 parts of rich lime, 50 of sand, 15 of uncalcined clay, and 5 of powdered silicate of potash, are recommended by Kuhlmann as having all the requisite hydraulic properties, especially for

cisterns intended for spring water. In marine constructions an excess of silicate should be added; *BUILDER Journal*, 1858, xxi, 402. In the *Proceedings* of the Inst. of Civil Engineers, 1879-80, lxii, 187, it is stated that J. Grant had said (1865, xxv, 78) that salt water might be used in mixing with Portland cement with as good results as with fresh water. Mr. Fajja had lately made some experiments on that point, and the results with the two kinds of water were certainly not the same.

In reference to durability of wrought iron exposed to the action of sea water—upon many of the reefs in Long Island Sound, and Fisher's Island Sound, wrought iron spindles were erected, about 4 ins. diam. and 15 ft. to 25 ft. in height; they lasted from 15 to 20 years unless carried away by the ice. The wasting takes place principally between high and low water, and in the case of one spindle that had been fixed 20 years, the diameter was reduced to 2 ins. *CIVIL ENGINEER, ETC., Journal*, 1844, vii, 68, from the *American Journal* of the FRANKLIN INSTITUTE. Gen. PASLEY observed that cast iron immersed for a considerable length of time in salt water, became soft, and the metal would in time give way, but that no perceptible action could be perceived either on lead, brass, or copper, under similar circumstances. It has the effect of reducing the iron to a body similar in its chemical properties to black lead. A cannon ball after having been sunk for 150 years, upon being exposed to the air gradually became red-hot and then fell into a red powder resembling burnt clay; *FINDLAY, On Lighthouses*, read at SOCIETY OF ARTS, 15 Dec. 1847. Iron guns fished up 1822 and supposed to have been about one hundred years under water, were found to be quite soft, but hardened after a time; Sir J. RENNE, 1846. The cast iron raised from wrecks sunk 1711 and 1782, was generally soft, and in some instances resembled plumbago; some of the shot burst by heat into several pieces under a cutting or pounding action. The wrought iron was not so much injured, except when in contact with copper or with gun metal, and unequally so: and neither the copper nor the gun metal was much acted upon except in contact with iron. Other instances are recorded at the end of the paper on *Screw Propellers*, read by J. GRANTHAM, at INST. OF CIVIL ENGINEERS, 1844, Feb. 13, 20, and 27; and printed in *CIVIL ENGINEER, ETC., Journal*, 1844, vii, 189-90; also mentioning that the water of the Thames, up as high as Richmond, had the same effect as sea water in rendering cast iron soft. It was said that hard grey cast iron with a good surface subjected to the action of sea water, little injurious effect was to be dreaded. The cast iron of a propeller was found *cir.* 1844 to have become so soft that it could be cut with a knife—perhaps from its working too near the copper sheathing of the vessel.

SEA WORM; see **PILE** (p. 112). **TEREDO. PRESERVATION OF TIMBER.**

SEBASTIAN (.....); assisted at the hofkirche, 1756-8, at DRESDEN.

SEBASTIAN (SAN); see **SAN SEBASTIAN**.

SEBASTIANO of Florence; see **PIETRASANTA** (G. da).

SEBASTIAO (SAN); see **RIO DE JANEIRO**.

SEBENICO. A royal Hungarian residence in 1105 and 1167; a town of Dalmatia in the Austrian dominions. The river Kerka forms close by a series of cascades 250 to 300 ft. wide by 25 ft., 50 ft., or 170 ft. high according to the flush of water. The fortress of S. Niccolo was a masterpiece of fortification 1546 when designed by M. Sanmichele and carried out by his nephew Leonardo; RONZANI and LUCIOLI, *Fabbriche, etc.*, fol., Ven., 1831; Milan, 1875-8, pl. 137. The cathedral dedicated to S. Giacomo maggiore apostolo, was erected 1415-1555 by a native architect; in a style called Lombardic Romanesque and cinque cento, also Florid Venetian Gothic. A crypt or baptistery is of transitional style. The church has a lofty dome which with the vaulted roofs are formed of slabs of stones carefully fitted to one another; and a gallery or triforium all round the interior. In the front is a rose window of 24 leaves below one of twelve. The stalls are of white marble. **STRANGFORD**,

Eastern Shores, 8vo., London, 1864, p. 257. CASSAS, *Voy. Pitt. en Istrie*, fol., Paris, 1802, p. 95. 14. 26. 28. 50. 96.

SEBREGUNDIO (NICCOLO), born in the Valtellina, carried out the palazzo Crescenzi at Rome, designed 1605 or later by the painter G. B. Crescencio or Crescenzi; FERRERIO, *Palazzi*, fol., Rome, 1655, pl. 58-9; or ii, pl. 16-7. He erected the church of Sta. Maria del Pianto; and entered the service of duke of Mantua. BAGLIONE, *Vite*, 4to., 1733, p. 250. 68.

SEBROKE or SEABROKE (THOMAS). Abbott of Gloucester 1453 until his death 1457. He commenced the erection of the elaborate central tower, and committed the supervision of its completion to Robert Tully or Toly, a monk (bishop of S. David's, 1469-82); DALLAWAY, *Discourses*, 8vo., London, 1833, p. 178, relates the tradition that John GOWER was the master mason 1456-69. 19. 51.

SECCADENARI (ERCOLE), 1530 succeeded Arduino at S. Petronio at Bologna; MUZZI, *Annali*, 8vo., Bol., 1844. 105.

SECCI (MARTINO), of Cremona, was probably of the family of the artist of that city, and flourished about the end of the XVI cent. 57.

SECLUSORIUM. The place in large Roman aviaries wherein birds were confined for the purpose of being sold, or killed out of the sight of their companions. SMITH, *Dict. of Ant.*, p. 69. 6.

SECOS. In the Egyptian temples the *secos* was the same as the ADYTUM of the Greeks and Romans, which article also refers to the impositions practised in them. CELLA. *Secos* and also *temenos* are sometimes met with in ancient writers as meaning the temple itself; BINGHAM, *Origines*, 8vo., London, 1840, ii, 357.

SECRÉTAIN (PIERRE); error for SEGRÉTAIN (P.).

SECRETARIUM. A sacristy. In the time of Diocletian, the *auditorium* of justice was also called by this name; SMITH, *Dict. Antig.*, s.v. The epistle of Paulinus, bishop of Nola, to Severus (Ep. 12; *cir.* 409 A.D.), states that the *exedra* contained two chapels, the one on the right hand was a sort of sacristy for the utensils or vestments (and if so, the *cappæ* may have been among them and hence the name), and on the left a library. Similar recesses or exedrae are found in the basilica at Herculaneum, and in that of Eumachia at Pompeii. In the second council of Arles, this term is used for that part of the church containing the altar; ECCLESIOLOGIST *Journal*, 1849, ix, 170. BINGHAM, *Origines*, ii, 458-471, states that sometimes there were three *secretaria* in one church, two being in the building, and one amongst the exedrae. The two former were called *diaconicum bematis*, and *seuophylacium*; the other *diaconicum magnum* or vestry, and also called *receptorium*, *salutatorium*, etc. Parts of them, or the whole, occasionally served as *decanica* or ecclesiastical prisons. SCHAYES, *Arch. en Belgique*, 8vo., 1850, i, 70. MIGNE, *Patrologie* (Onomasticon rerum), 8vo., Paris, 1859, lxxiv, 502-3. 19.

SECRET CHAMBER. This has been found in temples from which the oracles were delivered; as at Nimroud, Medinet Haboo at Thebes; and the Iseum at Pompeii (ADYTUM; CELLA). Under the pavement outside the Templars' church in London, on the south side, there is a vault executed in neat masonry; it is not like a catacomb, but may have been a muniment room. One at the château de Madrid; PATTISON, *Renaissance of Art in France*, 8vo., London, 1879, p. 63. Other examples are mentioned in NOTES AND QUERIES *Journal*, 5 Ser., xii, 248, 312; 6 Ser., ii, iii, iv, v, vi, viii, x, 37, 158, 393, 507; and xi, 53, 214, 317.

SECRET HOUSE; *Secretæ domus*; see JOINTURE.

SECRET OF ART; see MAGISTERIUM.

SECRET PASSAGE; see PASSAGE; and SUBTERRANEAN.

SECOLE or SEROLL. A village two miles from BENARES.

SECTILE; OPUS. The second kind of ancient MOSAIC work applied to pavements generally, and mentioned by VITRUVIUS. It was formed of *crusta* or slices of marble.

SECTION (It. *spaccato*; Span. *cortes*; Fr. *coupe*; Ger. *durchschnitt*). The geometrical or vertical elevation showing the

interior of a building, or of a solid. It is also applied sometimes to the horizontal section or PLAN of a building. The term PROFILE is applied to the section of a moulding or series of mouldings; and SCLAGRAPHY used to be applied to such drawings.

SECUNDRÁ, now written SIKANDRA (HUNTER, *Imp. Gazetteer of India*, 8vo., London, 1881). A town in Hindostan, probably a former extensive suburb of the city of AGRA, now merely a collection of ruins, of noble gateways, etc. The only entire structure is the magnificent mausoleum of the emperor Akbar (died 13 Oct. 1605), finished 1613 by his son the emperor Jahangir; designed upon a Buddhist model; it is covered with elaborate and coloured decorations. Dr. MURRAY, *Scenes of the War*, 5 photos, Nov. 1857. FORREST, *Pict. Tour of the Ganges and Jumna*, 4to., Lond., 1824, p. 184. SLEEMAN, *Rambles*, 8vo., London, 1844, ii, 38, three coloured plates. FERGUSON, *Indian and Eastern Arch.*, 8vo., London, 1876. 50.

SECURITY. The term used when a person undertakes to be responsible for the work he is about to perform, sometimes naming one or more persons as sureties for his so doing. Thus W. Edwards in 1746 in building the bridge at Llantrissant "gave security for seven years". LLAGUNO, *Noticias, etc.*, 4to., Madrid, 1829, iii, 74, states that 1587 a contractor offers his wife's body and goods for security of contract. CONTRACT. RESPONSIBILITY.

SECURO (FRANCESCO), of Sicily, a military architect, 1778-9 designed the theatre del Fondo, at Naples; it is a miniature of San Carlo; and 1781 the festivities in honour of Sta. Maria del Carmine. 95.

SEDAINE (MICHAEL JEAN), born 1768, was a member of the academy of architecture at Paris; and died 17 May 1797, aged 78.

SEDILE; SEDILIA (Fr. *gradins*; Ger. *sedill*). About the end of the XII century, the custom began of constructing seats in the wall of the chancel, near the altar, for the officiating priests. They are mostly found on the south side; an example occurs on the north side, as the recesses (perhaps removed) at S. John the Baptist church, Halesowen, Shropshire; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., Lincoln, 1878, p. 95. Those in the north aisle of Dursley church, Gloucestershire, have apparently been moved to that place; FREEMAN, in ARCHÆOLOGICAL INSTITUTE, Oxford volume, 1854, p. 253, who suggests that those in Dorchester church are later insertions. In Lenham church, Kent, is a single stone arm-chair, commonly called "confessional chair"; and at Cogenhoe, Northamptonshire, one long bench for two or three persons. The seats are usually three in number, for the bishop, archdeacon, and rector, or for the priest, deacon, and subdeacon; and are connected with a piscina. There are instances of four, as at Cotherstock, and Rothwell, both in Northamptonshire; of five, as in Maidstone church, Kent; Southwell minster; and Great Yarmouth; and even of six, as at Sedgebrook, Lincolnshire. These seats are sometimes on a level, but often raised one above the other; and are rare in chantries and south chapels. An example of a wood sedilia occurs at Rodmersham, ARCHÆOLOGIA, xi, 391-3. In the Middle Pointed churches of Cornwall, the sedilia (a very rare thing) and piscine, almost always of curiously uniform design, and generally in the east walls. The sedilia dating 1230 in Preston church, Sussex, are given in BUILDING NEWS *Journal*, 1871, xx, 93. In a curious double sedilia, XIII cent., at east end of south wall of the abbey at Denbigh, one is pierced at back as an opening, or perhaps low side window; WILLIAMS AND UNDERWOOD, *Denbigh. Churches*, fol., 1872, pl. 42. PRISMATORY. CHANCEL BENCH.

Sedilia are common in Scotland; some are mentioned by MUIR, *Churches of Scot.*, 8vo., Oxford, 1848, xxiii. Four at Furness abbey, and at Paisley.

PRIM, *Observations on Sedilia in Irish Churches*, in KILKENNY ARCH. SOCIETY, *Trans.*, 8vo., Kilk., 1849, i, 51-83; refers to Jerpoint abbey, Ballylarkin church, Callan abbey, and has long dissertations on that in Holy Cross abbey, Tipperary, resembling

a tomb with a canopy, end of XV cent.; *BUILDER Journal*, 1854, xii, 195.

A list of Sedilia in England is given in *ARCHÆOLOGIA*, 1792, x, 261-324; and xi, 372-4, with curious observations. CLARKE, *On Episcopal Chairs and Stone Seats, etc.*; *ARCHÆOLOGIA*, read 1793; xi, 1808, p. 317. RICKMAN, *Attempt, etc.*, 8vo., Oxford, 1862, p. 53. CARTER, *Ancient Arch.*, fol., London, 1795-1807, pl. 24, 58, 77. PUGIN, *Examples, etc.*, 1838, i, pl. 42. EXETER DIOCESAN ARCH. SOCIETY, *Transactions*, 4to., 1843, ii; and 1853, iv, p. 94. *On Sedilia and Altar Chairs*, in *ECCLESIOLOGIST Journal*, 1844, ii, 90-2. 1. 17. 19.

Sedilia, rare in France, are found in Normandy and Brittany. In Sens cathedral are five connected seats rising one above the other, for the celebrant, two deacons, and two subdeacons; while near the lowermost is a detached seat for the archbishop. WEBB, *Continental Ecclesiology*, 8vo., London, 1848, p. 157, mentions that in the hospital church at Stuttgart is "the original sedilia, a very rare Continental feature, viz., a broad niched seat with mouldings"; that in the Carmelitankirche at Boppard is a rare example of a triple sedilia of wood with canopies (p. 58); and (p. 119) five sedilia ascending on both sides to the middle one, in Ratisbon cathedral. The sedilia in the church of S. Blaise at Muehlhausen is given in STATZ AND UNGEWITTER, *Gothic Model Book*, fol., pl. 117.

SEDILE (It.); see SEGGIO.

SEED ROOM. This with the FRUIT ROOM should be placed adjoining each other, and form part of the gardener's dwelling. Its arrangement is detailed in LOUDON, *Encyc. of Gardening*, 8vo., 1850, p. 629; 631.

SEELAND (EDMUND), lived 1822 at Mayence; he drew a plan of the cathedral and of the baptistery chapel of 1828. 68.

SEELING. CIELURE; cieling or CEILING since about 1736; ceeler; CILERIE. Selyng (as s.v. partition); selure, silour, silouring, selyd. Wood or plaster work to cover the timber, stone, or brick materials forming the side of a room. 1434 "John Bery or Bury desires the chancel to be selyd with estrych bord"; BLOMEFIELD, *Hist. of Norfolk*, 8vo., London, 1805, vi, 218, 223. 1572 occurs "the seling of bothe the sides of the hall to be wainscoted with wainscote"; JUPP, *History*, 8vo., London, 1848, p. 223. In 1535, "sealyng of the greates chamber" 73 yards at 6d. per yard, was done by a man "who made three payer of bryck molds"; GAGE, *Hengrave Hall*, 4to., London, 1822, p. 51. WHITAKER doubted the introduction of wainscoting on walls, or *seeling* at all, before the reign of queen Elizabeth (1558-1603); but the Cottonian MS. Vitellius states that in the house of Richard Fernor of Enstone, gent. (temp. Henry VIII), "the sydes of the perlor were celyd with wenskett"; HUNT, *Tudor Architecture*, 4to., London, 1836, p. 13. The London Company of Joiners is also called "Joyners and Seelers"; in 1621-2 "the master and wardens of the Company of Joyners, ceelers, and carvers within the city of London" are mentioned; JOINER. "Sealing" was called "boxing" 1717-8 in Scotland, "80 yards at 10d. per yard"; SPALDING CLUB, *Cawdor Papers*, 4to., Aber., 1859, p. 425. "Selyng nails" occurs in BRITTON AND BRAYLEY, *Palace of Westminster*, 8vo., London, 1835, p. 191. The term "wainscoting" only, occurs in MOXON, *Mechanick Exercises* (House Carpentry), 4to., London, 1678, p. 105. LAMBRUSCATURA. ESTREGE BOARD. 4. 16. 17. 19.

SEES or SEEZ. The capital of the Sarii or Sessunii, or Seisii (Anc. Agritum). A town of great antiquity in the département of Orne in Normandy, situated on the river Orne. The cathedral dedicated to SS. Cervaïs and Protasio, was first erected by a monk AZON. Again 1049-50, by bishop Yves de Sees, count of Bellême and Alençon, burnt 1064, and consecrated 1126. The present nave with the west front and lofty porches are early XIII century, the upper part being about fifty years later; the wood door is the original one (DOOR); one side porch is given in SHAW, *Architectural Sketches*, 1853, pl. 34; and the centre one in *BUILDING NEWS Journal*, 1872, xxiii, 282; VIOLET LE DUC, *Dict.*, ix, 351, fig. 4. The choir built 1230, was rebuilt

1260 after a fire; the lady chapel dates 1230; bishop John de Bernières died 1294 is called "hujus loci edificator". The foundations being insufficient necessitated the pulling down and rebuilding of the choir 1818-49 under J. A. Alavoine (died 1834) and others, with the reconstruction of the spires which had been supported in XIV cent. by huge buttresses. LA BORDE, *Mons. de France*, fol., Paris, 1816, plan on pl. 158. KING, *Study Book, etc.*, fol., London, 1858-67, i, 10 plates. DALY, *Revue générale*, xii, 179, gives *Histoire de sa cathédrale en 1775*; with *painting*, xii, 123. VIOLET LE DUC, *Dict.*, s. v. Cathédrale, p. 357. JOANNE, *Normandie*, 8vo., 1872. The grand séminaire is in the former abbey of S. Martin. The chapel of the small séminaire, DALY, xx, 98. The episcopal palace dates 1778. 1853 bronze statue of Conté, a savant of Egypt and inventor of the black chalk crayons. 23. 50. 96.

SEFFRID. The second bishop of that name of Chichester, consecrated 17 Oct. 1180, rebuilt 1185-99 his cathedral after the fire of 1180; the master mason being supposed to be Walter of COVENTRY. Seffrid also rebuilt the palace, cloisters, and the commons houses. He died 17 March 1204; his effigy is on the south side of the door of the duke of Richmond's vault. HAY, *History of Chich.*, 8vo., Chich., 1804, p. 261; 384; 444.

SEGALONI (MATTEO), 1625 rebuilt La Badia of the Benedictines at Florence. ZOCCHI, *Streets, etc.*, in *Fir.*, fol., 1754, pl. 18. 68.

SE GAN FOO. The capital of Shen se province, in China, and one of the largest cities of the empire, four miles in compass, surrounded by very broad walls flanked with towers. The palace was built by one of the ancient kings; it is occupied by the general in chief of the imperial forces. GUTZLAFF, *China Opened*, 8vo., Lond., 1838, p. 103.

SEGESTAN; see SEISTAN, in Persia.

SEGESTE or Segesta; also called Egesta, properly *Egesta*, in Sicily, now represented by the village of Marcellini. The theatre is 193 ft. wide; only the seats remain; several of the upper ones are backed like chairs. The remains of a temple, indicating by its unfuted columns that it had not been completed; perhaps stopped B.C. 580, or 409 (*Handbook*). Like the two great hexastyles at Syracuse and Paestum it has 14 columns on the side. Its dimensions, 190 ft. by 77 ft. on the top step or 191-7 and 76-5 (*Handbook*), are nearly those of the temple at Paestum; the entablature is nearly half the height of the columns; there is no cella. LEAKE, *Morrea*, 8vo., London, 1830, iii, 279. The columns and pediments were restored by the king of Naples, as recorded on the front architrave; ALLAN, *Pict. Tour*, fol., London, 1843, p. 88 and plate. BARTLETT, *Pictures from Sicily*, 8vo., London, 1853, p. 147-9. FASO DI PIETRA SANTA, *Antichità*, fol., Pal., 1834, i, 16 pl. GOLDICUTT, *Antiq. of Sicily*, fol., London, 1818, 4 plates. SAINT NON, *Voy. Pitt. de Naples, etc.*, fol., Paris, 1781-6. WILKINS, *Magna Græcia*, fol., Camb., 1807, p. 51, 5 pl. HITTORFF, *Becueil des Monst. de Segeste, etc.*, 10 plates, fol., Paris, 1870. GALHABAUD, *Monuments*, 4to., Paris, 1842-50, i, pl. 13-4, shows a plinth to the column. WOODS, *Letters*, 4to., London, 1828, ii, 352. 25. 28.

SEGGIO. A council chamber. A term which, like its synonym SEDILE, when applied to a building, has puzzled many Englishmen. "It is the local name, at Naples, for a council. In 1696 the senate was composed of six seggie or seats, for so they call the counsellors, five of nobility and one of the commons, who choose two elects; every seggie or chamber chooses two deputies; one of the two governors, and the other rests, by turns; so there are six deputies, one for every seggie, who vote in all affairs, and without them the viceroy cannot impose a tax, etc."; CAMDEN SOCIETY, DRUMMOND, *Lord Perth's Letters at Drummond Castle*, 4to., London, 1845. P. Ligorio was "nobile del saggio di Porta nuova" and the other seggie will be found in SIGISMONDI, *Descr. di Napoli*, 8vo., Nap., 1788-9, index. MURRAY, *Handbook to Naples*, 1853, p. 120. 1742-8 the sedile or seggio di Porto or di S. Giuseppe, at Naples, was designed by M. A. Gioffredo or Cioffredo; "it is one of the halls or headquarters of each asso-

ciation; they are lofty and fanciful structures, open on all sides, and decorated inside with coats of arms of the families belonging to the respective associations"; ACKERMANN, *Repository of Arts*, 8vo., London, 1813, ix, 260.

SEGMENTAL ARCH. An early antique example over columns, the precursor of the semi-arch springing from pillars, occurs in the apartment in the "House of the Nereids", at Pompeii; LIBRARY OF ENTERTAINING KNOWLEDGE, *Pompeii*, 8vo., Lond., 1832, ii, 205-6. A slightly stilted segmental arch occurs near the infirmary of the cathedral at Peterborough.

SEGMENTAL-HEADED WINDOW, and segmental pointed, are shown in FREEMAN, *Window Tracery*, 8vo., Oxf., 1851, p. 253; and *Llandaff Cath.*, 33; and *Hist. of Architecture*, 350.

SEGMENT ARCH. A portion of a circle. A ready mode of obtaining the line of arch is detailed in MECHANICS' MAGAZINE for 1823: thus, D C being the

diameter and E F the versed sine, take a board equal to D E B C F D; put in a nail or pin at D and E, and slide the board along and against them, tracing the arch line as it moves along.

SEGMENT DOME. One of this form was designed 1487 by B. Pintelli to the church of Sta. Maria della Pace, at Rome. LETAROUILLY, *Edifices Modernes*, fol., Paris, 1825-50, pl. 63; text p. 204-5.

SEgni (Anc. Signia). A very ancient town in Southern Italy, situated near Frosinone, on a mountain of the same name. The walls, the porta Saracinesca and porta in Lucino, afford good specimens of cyclopean work of the Pelasgic era; a cut is given in LIBRARY OF ENTERTAINING KNOWLEDGE, *Pompeii*, 8vo., 1831, i, 63-4. The opus signinum is so called from being first used in this town, which is the see of a bishop and has a handsome cathedral dedicated to S. Pietro, on the site of the temple, the cella of which is included. Adjoining is a well-preserved Roman cistern. HOPE, *Hist. of Arch.*, 8vo., London, 1840, p. 55.

SEGODUNUM. The ancient name of RODEZ, in France.

SEGORBE (Anc. Segobriga Edentanorum). A town in the province of Valencia, in Spain; taken from the Moors in 1245. The walls are in tolerable preservation. The cathedral dedicated to the assumption of the Virgin, is of Pointed architecture and not remarkable. S. Martin de las monjas has a Doric façade, and has the tomb of the founder. F. de VILLAGRASSA, *Antigüedades*, 4to., Val., 1664. About a mile distant is the celebrated Carthusian monastery of Val de Cristo, now suppressed, founded by the infante Don Martin, son of Peter IV king of Aragon.

14. 28. 50. 96.

SEGOVIA (Anc. Segobia; Secuvia). An old city of Old Castile, in Spain, situated on a lofty eminence, and washed by the streams Eresma and Clamores. The aqueduct is attributed to the emperors Trajan (98-117) and Hadrian; the arched portion is 2921 (or 2400) ft. out of a total length of 10 or 11 or 15 miles; the granite uncemented arching has 170 (109) openings, the highest being 102 (104) ft. high; in one portion it has a double row of arches, 8 ft. wide. In 1071 the moors of Toledo destroyed 35 arches; these were ably restored 1481-3 for queen Isabella II by fray Juan de Escobedo, a monk of the Parral convent (*Detached Essays*, p. 16, pl. 1, fig. 13). D. Gamones measured and engraved it, 1750. A. G. de SOMORROSTRO, *El aqueducto y otras antigüedades de S.*, fol., Mad., 1820. TAYLOR, *Voy. en Espagne*, 4to., Paris, 1826-32, pl. 20; p. 145-8.

The thick walls and round towers were built by the Moors or by king Alonzo VI (1072-1109). The Moorish puerta de Santiago, and the puerta de S. Andres are noticeable. The keep or *alcázar* by Alfonso X (1252-84) has a number of angular turrets: it was greatly repaired 1352-58; 1412 the sala Artesan was erected; 1456 the sala de la Medianaranja was designed by C. del Alcalde for king Enrique IV (1454-76), when perhaps the walls of the front towards the city were ornamented by plaster diapering, the patterns of the latest Gothic repeatedly struck,

ARCH. PUB. SOC.

and still in good condition though done in xv cent. (STREET, p. 192-3. PLASTERWORK). In 1565 considerable repairs were effected by G. de Vega, and after 1587 by F. de Mora for king Philip II. The castle was from 1764 used as a training college for cadets of the royal artillery, and from 1820 for all classes. On 7 March 1862 it was greatly damaged by fire; in Dec. 1881 the government ordered it to be conserved and restored. TAYLOR, pl. 19. Two good views are given in Louis MEUNIER, *Diverses Vues, etc.*, obl. 4to. (1650). The houses are old and curious; arches whose voussours are immense; and a number of Norman doorways. GAILHABAUD, *L'Arch.*, etc., iii, and the SPANISH GOVERNMENT grand work, give a private house, and the tower of defence of another, both decorated with plasterwork. The casa de los Picos is a copy of a Florentine palazzo with faceted stones and a marble settee.

In 960 king Abderahman caused the *aljama* to be restored and added columns, CONDE, *Dom. of the Arabs*, 8vo., London, 1854, i, 454. The city is the see of a bishop suffragan to Valladolid. The cathedral, dedicated to Nuestra Señora de la Paz, is 380 Span. ft. long by 180 ft. wide, with a tower 330 ft. high. It is the last of the pointed churches but is of a poor style (STREET, *Gothic Arch. in Spain*, 8vo., Lond., 1865, p. 182, who gives a plan). It was commenced 8 June 1522 by Juan Gil de Ontañon, *maestro mayor*, on the model of his church at Salamanca, but in consequence of ill-health and absence he was superseded 1525 by G. de Cubillas, the *aparejador*: the works were inspected 1529 by H. de EGAS and A. de COVAREBIAS. 1524 J. de Campero contracted to remove a cloister from the site of the old cathedral to that of the new one, and 18 June 1530 to give the cloister an additional height of 3 ft. and to add a new portal: CHAPUY, *Moyen Age monumentale*, fol., Paris, 1840-4, pl. 273. The first stone of the capilla mayor was laid 5 Aug. 1563 by Rodrigo Gil, *maestro mayor* in 1560; he 1568 succeeded to G. de Cubillas; and died 1577. The capilla de la Piedad has a fine wood retablo carved 1571 by Juan di Juni. 1576 M. Ruiz de Chartudi was *aparejador*. *Cir.* 1590 B. Pedraja "constructed" eight chapels assisted by B. Eloriaga. Sept. 11, 1615 the cupola and lantern were commenced. 1620 P. de Brizuela, *maestro mayor*, designed the winding stairs to the top of the edifice, the roofing, the restoration in stone of the lantern on the dome which had been burnt, and the north portal (Italian Doric), also attributed to F. de Mora and to J. de Herrera, but was erected 1626 by J. de Mugaguren (S. G. work). F. de Campo Aguero, *maestro mayor*, died 1660, and was succeeded by F. Biadero, died 1678. In 1740 T. M. Albarra, *maestro mayor*, did the lantern in place of the spire which had been destroyed by lightning. 1750 D. Gamones was architect; 1780 F. Sabatini designed for king Charles III the rich retablo mayor de marsoles; and 1783 don V. Rodriguez directed the translation to the *trascoro* of the cathedral, the altar in the chapel at Riofrio. PONZ, *Viaje de España*, 8vo., Madrid, 1781, x. BUILDER *Journal*, 1885, xlviii, 577, and plate.

The church of La Vera Cruz, 1204-8 for the Templars has 12 sides and is partly ruined; in the centre is a two-story walled chamber on the model of the Holy Sepulchre. STREET, p. 184.

Dominican church and monastery of Santa Cruz 1218; re-edified 1492 by Ferdinand and Isabella; 1572 the retablo of the capilla mayor by J. de Herrera.

Tower of the monastery of Sto. Domingo. S. G. work, which also gives Zocalos pintados; and S. Lorenzo.

S. Millan parish church, about 1150, the finest; external cloisters on two sides of the nave, added *cir.* 1250. STREET. S. G. work. GAILHABAUD, *L'Arch.*, etc., 4to., Paris, 1858, i, pl. 28.

S. Martin, is somewhat similar, with a rich portal; S. G. work; *Moyen Age mont.*, pl. 186. S. Roman; S. Facundo; Sta. Trinidad; S. Nicolas; and five others. STREET.

S. Miguel is perhaps by the same hand as the cathedral. STREET.

Monastery of Corpus Christi, a fine old synagogue decorated in a similar style to Sta. Maria la Blanca at Toledo; S. G. work, part 76.

S. Francisco.

S. Esteban has an open cloister on three sides, and a noble xiii cent. tower. STREET. S. G. work.

In the Cartujar (el Paular), 1390, A. Rodrigo did the capilla de los reyes

The Hieronymite monastery of Sta. Maria del Parral, is supposed to have been designed *cir.* 1459 by J. Gallego, with its fine portal. 1472-85 the capilla mayor was to be completed in three years by P. Polido de Toledo and J. de Guas de Segovia; 1491 the coro was rebuilt by J. de Ruesga; 1526 the walnut wood *silleria* by B. Fernandez; the ceilings of the library and refectory are worth notice with its good pulpit. (STREET.) 1529 J. Campero raised the tower 29 ft. A tomb and entrance, in ESCOBURA and VILLE AMIL, *Espagne Art.*, fol. Paris, 1842-59, iii, is reproduced in *BUILDING NEWS Journal*, 1858, iv, 865-6.

The episcopal palace; the casa de moneda or mint, a very fine stone edifice, rebuilt 1455 by Enrique IV; repaired 1586; the gold and silver coinage removed 1730 to Madrid; the academy of fine arts and picture gallery; the theatre, and prison, are noticeable. The city has not recovered the sack of June 7, 1808, by the French. Near it is the curious castle de Coca, TAYLOR, pl. 20 bis. CALVETE, *Historia del Glorioso S. Frutos*, Vall, 1616. COLMENARES, *Hist. de la ciudad de S.*, fol., Seg., 1637, 2nd edit., 1640. SWINBURNE, *Travels in Spain*, 4to., Lond., 1779-87, p. 404-10. *Ferromnerie* at Segovia and Toledo, in DALY, *Revue Générale*, 1867, xxv, pl. 26-7; and xxvi, pl. 45-6. 14. 28. 50. 96.

SEGRETAINE (PIERRE THÉOPHILE), born 1798 at Niort in France, was educated at the Polytechnic school, and studied under L. Bruyère. In 1824 he was appointed architect of civil buildings to the département des Deux Sèvres, whereat he designed 1828-32 the hôtel de préfecture (GOURLIER and others, *Choix d'Edifices*, fol., Paris, 1825-30, iii, pl. 284-5); a palace of justice; two cantonal churches; a Protestant church; several bridges of little importance; and many private houses. About 1830 his design for an establishment of prisons was approved. He died 1865 at Niort. 68. 110.

SEGUNTUM; error for SAGUNTUM, in Spain.

SEGURA (ANTONIO DE), also a painter, was employed 1580 to carve a retablo for the Hieronymite monastery of S. Yuste, and to copy for it "the Glory" by Titian, then removed to the Escorial. King Philip II being greatly satisfied with his works, appointed him 1587 *aparcijador* at Aranjuez; 1591 at the alcazar at Madrid with a salary of 200 ducats for his life, in which city he worked (or built) in the house of Campo, at the palace del Pardo (under F. de Mora), and it is considered the house of don García Hurtado Mendoza, marquis de Cañete, in the principal street. He succeeded B. Ruiz on his death 1593 at the monastery at Uclés and designed the dome completed 1597 of the church. A fire 13 March 1604 having destroyed the towers and chief courts of the palace del Pardo, Segura was appointed under F. de Mora to rebuild them at an estimated cost of 80,000 ducats, and dying in 1605 at Madrid was succeeded by D. Sillero and by P. García de Manzuécos, all builders at the alcazar. King Philip III gave a pension to his widow and continued it to his daughter. 65. 66. 68.

SEGURA (ALONSO), son of ANTONIO, 1597 worked under F. de Mora. 66.

SEGUSIUM. The ancient name of SUSA, in Italy.

SEHEULT (F. L.); error for SCHEULT (F. L.)

SEIGNO or Signo. Anc. ÆQUAM, near Spalatro.

SEIS; see SÉES, in France.

SEISTAN or SEGESTAN. A large part of the province Aria of the old Persian empire, and now a province of Afghanistan. Dooshak or Dushuck, the capital, is supposed to be the former Zarang, and to have been built on the site of Jellalabad. Numerous embankments and ruins widely dispersed afford evidence of a former large and rich population. CHRISTIE, 1810. KINNEIR, *Mem. of the Persian Empire*, 4to., 1813. CONOLLY, *Sketch*, etc., in *Journal of the ASIATIC SOCIETY OF BENGAL*, Sept. 1840. 14. 50.

SELADON, Celadon, or CELANDINE COLOUR. Green with blue and grey. "Chinese green, with rose colour, assumed to be the true Greek style, as opposed to the blood-red colour"; KUGLER, *Polychromie*, as translated in FALKENER, *Mus. of Class. Antiq.*, 8vo., Lond., 1850, i, 231.

SELCE ROMANO. A stone with which the streets of Rome

have been paved from the time of the ancient Romans; it is obtained from the quarries at Capo di Bove; BEARD, *Mineralogie*, 8vo., Paris, 1821, ii, 70.

SELDAM. The stone *sild* or shed on the north side of the church of S. Mary le Bow, Cheapside, London, erected by king Edward III and used by him and his successors from which to see the jousts and ridings. STOW, *London*, p. 97. CUNNINGHAM, *Handbook of London*, 8vo., London, 1850, p. 111.

SELEFKEH; see SELEUCEIA Trachea, in Asiatic Turkey.

SELENITE. A sulphate of lime, *i.e.*, sulphuric acid and lime; a transparent or crystallized variety of gypsum, and found in clay districts. The larger variety is called ALABASTER. Very fine crystals of selenite, sometimes of a large size, are not unfrequently found in the fissures of the gypsum in the quarries of Castellina in Tuscany; and specially used for the cement for Scagliola, being sold at a higher price. GEOLOGICAL SOCIETY, *Quarterly Journal*, 1845.

SELENITIC LIME. About 1856 capt. (later general) Scott, R.E., observed that a limestone capable of conversion by burning into a hydraulic lime, might be able to furnish a good cement by simply allowing a small portion of sulphuric acid gas to pass into the kiln during the burning of the lime. The process since about 1870 is explained as consisting of carefully mixing with the water used in the preparation of the mortar a small quantity of the sulphate of lime, *i.e.*, gypsum or plaster-of-Paris, or green vitriol; the lime may be then ground in an ordinary mortar-mill with the mixture into a creamy paste for three or four minutes, the sand, burnt clay, or other ingredients may then be added, and the whole thoroughly ground for ten minutes more. The lime is a good buff in colour. Experiments prove that with double the usual quantity of sand the tensile strength of the mortar is increased by this process fourfold. Numerous experiments are recorded in the *ENGINEERING Journal*; and in *BUILDING NEWS Journal*, 1871, xxi, 12; and 1873, xxxiv, 815; 383. It is stated "to set rapidly and well, to be useful for concrete and bricklayer's work; and in lieu of Portland cement for concrete at less than half its price. As 'stuff' in plastering it effects a considerable saving in time over that made from lime in the ordinary way. Selenitic mortar saves half the lime, is four times as strong, and sets in a quarter of the time of common mortar. Selenitic clay can be used as a substitute for Parian and other similar cements. Plastering on walls can be done as two-coat work, while a ceiling can be floated immediately after the application of the first coat, and set in forty-eight hours. The mortar with six parts of sand will be found to set far harder and much more quickly than common mortar with two or three parts of sand. It is used for filling in the hollow parts of terra-cotta."

SELEUCEIA PIERIA. An ancient port and city in north of Syria, now represented by Souadieh. *Observations* by W. H. YATES, 1846-9, in FALKENER, *Museum of Class. Antiq.*, 8vo., 1860, ii, 111-31. ALLEN, *The Dead Sea*, etc., with map. 23. 28.

SELEUCEIA TRACHEA. An important town of Cilicia, and situated on the right bank of the river Ghink, the ancient Calycadnus. It rivalled Tarsus. A theatre, ruins of a temple converted into a church, and several large columns of the Corinthian order are the chief remains. The present village of Selefkeh is a wretched place. BEAUFORT, *Karamania*, 1817, p. 212-8. GRIMSTONE, *Hist. of the Turks*, states it was captured 1613 by the Florentines. 23.

SELEUCEIA. A former city of Assyria, situated on the right bank of the river Tigris, over which is a bridge of six arches. The city is mainly constructed of materials brought from Babylon which it replaced. It was the capital of the Macedonian conquests in Upper Asia, and was succeeded by Ctesiphon, which had arisen under the Parthians on the left bank. It was sacked 161-80 and burnt by the Roman generals in the reign of Marcus Aurelius (282-4). The ruins cover a large area. MYERS, *Remains of Lost Empires*, 1875, p. 254. FRASER, *Kowrdistan*, 1840, ii, 1. MIGNAN, *Chaldea*, 1829, p. 68.

KEPPEL, *India*, 1827, i, 124; 133. LABORDE, *En Orient*, 1838. RICH, *Res. 1812 in Kourdistan*, ii, 405. 14. 50.

SELGE. A chief town of the former province of PISIDIA. Situated about 24 miles to the south-east of Sagalassus in Pamphylia, and about ten miles to the north-east of Boojak, is a ridge of marble arising about 1,000 ft. on three sides; on it are the ruins of one of the finest cities that probably ever existed—at least three miles long—50 or 60 temples or columned buildings—vast arched vaults—early Greek—sculptures ranking in date with the *Ægina* marbles—style generally plain Corinthian; FELLOWS, *Excursion*, 1839, p. 171-3. ARUNDEL, *Asia Minor*, 1834, ii, ch. 3. ARUNDEL, *Visit to the Seven Churches*, 1828. DAVIS, *Anatolica*, 1875. FELLOWS, *Lycia*, 8vo., London, 1841. 14. 28.

SELICANTARELLI (POMPEI), a pupil of L. Vanvitelli, restored 1794 the palazzo Lieto, at Naples.

SELINUS, or SELINUNTUM in Sicily. A city founded about 628 B.C., ranking next to Syracuse and Agrigentum; in ruins since its first destruction by the Carthaginians in 408 B.C., and was finally destroyed by them 250 B.C. It is situated on the river Selinus now called Madiuni. The "Selinuntine marbles" were discovered March 1823 by the English architects W. Harris and S. Angell; they are metopes from the middle temples on each hill, and were placed in the museum at Palermo; casts are in the British museum. By these excavations they ascertained the plans and details of six temples; the three (i pilieri dei giganti) on the western hill or acropolis, before unknown, were surrounded by the wall built by Hermocrates after 408 B.C.

On the eastern hill:—the first temple, supposed to have been dedicated to Zeus, and to have stood in the forum, is the largest but two of Greek temples (HERMOGENES), being about 367 ft. 6 ins. long by 160 ft. 11 ins. wide, with 17 columns on the side, and was octastyle and hypæthral. It was probably left unfinished about 409 B.C. The second temple, to the south, of which very little is left, was hexastyle with 14 columns on the side. The third one, more southward, is hexastyle with 15 columns on the side, and appears to have had an opisthodomus with staircases. In 1831 five metopes found by Serradifalco were placed in the museum at Palermo. On the western hill, or acropolis, about a mile distant:—are three temples, the middle one of which is the most ancient of the three; hexastyle with 17 columns on the side, a supposed unique example; metopes are given in ANGELL. The temple to the north of it was hexastyle with 13 columns on the side. South of this is an *ædicula* or temple in antis, the columns stuccoed and painted. The third temple, to the south, and the smallest, is hexastyle with 14 columns on the side, and is similar to the southernmost on the other hill; a winding stair just within the door of the cella led to the top of the cornice.

All the temples front the east and are of the Doric order, built of a very compact limestone of a greyish colour obtained from the quarries called Rocca di Cusa, seven miles distant; several blocks of columns and a capital prepared for the great temple still remain attached to the bed of the rock; the stone was covered with a thin coat of fine plaster still remaining perfect on many parts; some members were painted, also the soffits, red and blue being the prevailing colours. A finer compact limestone was used for the metopes, obtained from Menfiri, about eight miles distant, and still worked by the natives for ornamental details. The temples are considered to have been erected previous to the destruction of the city in the third year of Olymp. 92 (B.C. 408). The proportions of the columns vary from $4\frac{1}{2}$ to $5\frac{1}{4}$ diam. in height, and several were only prepared for fluting. The central temple on the western hill is supposed to have been the first erected after the foundation of the colony, about 650 B.C.; the sculptures may safely be placed at more than half a century prior to the assigned date of the *Ægina* marbles, and at least a century and a half before those of the Theseium. They retain some of the style and character of Egyptian sculpture; those on the eastern hill approach the style of the archaic or *Ægina* marbles.

PISANI, *Memoria sulle Metope Selinuntine*, 8vo., Pal., 1823. ANGELL AND HARRIS, *Sculptured Metopes*, fol., London, 1826, who give the plans of the six temples to one scale. LEAKE, *Marea*, 8vo., Lond., 1830, iii; 281-3. WILKINS, *Magna Græcia*, fol., Camb., 1807, p. 44. GOLDCUTT, *Sicily*, fol., Lond., 1819, pl. 9. FASO DUCA DI SERRADIFALCO, *Antichità*, fol., Pal., 1834-42, ii. ACCADEMIA DEI LINCEI, *Not. degli Scavi di Antichità*, 4to., 1877, p. 66 *et seq.* gives a list by chev. Cavallari of the antiquities discovered near the temple of Hercules and now in the museum at Palermo. *L'Arch. au siècle du Pisistrate*, in DALY, *Revue Générale*, 1857, xv, plan pl. 1-2, 225-37; 289-97. *Antiquities of Selinus* in British museum, 1827. GAILHABAUD, *Monumens*, 4to., Paris, 1842-52, i, giving the largest temple. WOODS, *Letters*, 4to., Lond., 1828, ii, 352. BEAUFORT, *Karamania*, 8vo., Lond., 1817. HITTORFF AND ZANTH, *Recueil des Monts de Ségeste et de Selinonte*, fol., Paris, 1870, pl. 11-79. RAMÉE, *Hist. de l'Arch.*, 8vo., Paris, 1843, i, 391, only mentions three temples and refers to HOUEL, *Voy. Pitt.*, i, pl. 16; DENON, *Voy. Pitt.*, iv, 184; D'ORVILLE, *Sicula*, p. 60; HITTORFF AND ZANTH, *Arch. Antique*, pl. 10, 29. REINGANUM, *Selinus*, p. 78; and GÖTTLING, *Hermès*, xxxiii, 235. FERGUSSON, *Hist. of Arch.*, 8vo., 1865. GWILF in Essay prefixed to CHAMBERS, *Civil Architecture*, 1825, p. 41. 1. 2. 14. 23. 25. 28.

SELINUS in Cilicia. In 117 the emperor Trajan died there and hence it was called TRAJANOPOLIS. BEAUFORT, *Karamania*, 1817, p. 186, mentions a mausoleum, agora, theatre (given as 114 ft. ext. diam., in LEAKE, *Asia Minor*, 8vo., Lond., 1824, p. 328), aqueduct, and some tombs. 23.

SELIO; see SYLLION.

SELL, SILL, Scill, and SOIL, often written CILL. A ground cill or GROUND PLATE; and "a window sell or window soil, which was the bottom piece in a window frame"; LANGLEY, *Builder's Jewel*, 4to., London, 1808. MOXON, *Mechanick Exercises* (Carpentry), 4to., London, 1693, p. 168. NEVE, *Diet.*, 1736.

SELLERS (THOMAS), with Nicholes Craven, contracted 1533, 24 Henry VIII, to rebuild in four years the "north and south lylings" of Burnley church, Lancashire, for £60. WHITAKER, *Whalley*, 4to., 1818, p. 323.

SELLI (NICCOLO DEI) and Niccolo Selli d'Aretino, are supposed to be the same person as Nicolo di Piero LAMBERTI, born 1350 at Arezzo, and died 1417 at Bologna. N. DA SELLI is stated to have designed from 1378 with Jacopo da Campione (died 1398) or with Marco da Campione (died 1390), the church of the Certosa, near Pavia, begun 1396: PAVIA (p. 68a). 73.

SELSEY, in Sussex; a see established 681 and removed about 1082 by bishop Stigand to CHICHESTER.

SELURE; see SEELING.

SELVA (GIOVANNI ANTONIO), born 13 June 1753 at Venice, studied under his uncle abate G. Selva, painting, etc., under P. A. Novelli, and architecture under T. Temanza. In 1778 he set out for Rome, and visited various Italian cities with Canova. At Rome he decorated an apartment for the senator Rezzonico, and another for a large entertainment for the nobleman Gir. Zulian. He then visited France and England and 1780 returned to Venice, where he designed the casa Mangilli; casa for conte Guido Erizzo; and rearranged the interior of palazzo Manen, a work by Sansovino; was appointed superintendent of the public buildings and gardens, the plan as laid out 1810 by him is given in CICOGNARA, ii: designed 1790-1 the teatro della Fenice, altered after the fire 12 Dec. 1837 by the brothers Meduna; and was appointed professor of architecture. At Padua he rebuilt the palazzo Pisani; at Trieste the theatre (much altered); and partly that at Florence; the façade of the casa Vigo d'Arzeri, and a casino at Padua; at Verona, the casa Vela; at Udine, the façade of the church of S. Spirito Sauto (or is by G. Massari), and a porta at S. Francesco detto l'ospedale (MANIAGO, *Udine*, 8vo., 1840, p. 60); at Venice he carried on the façade of the church of S. Maurizio begun by Zogari, and completed by Diedo with some modifications; who also completed the small church of del Gesù, after the death at

the beginning of 1819 of Selva, who is considered not to have designed the round church at Possagno, near Venice, as the first stone was not laid before 11 July (finished 1830); but he might have made the drawings for his friend Canova who built it and was buried therein.

He published *Catologo de' quadri, etc., della galleria del fu sig. conte Algarotti*, in *Opere*, Ven., 1791. *Delle diff. maniere di descr. la voluta Ionica, etc.*, 4to., Padua, 1814; *Elogio di San Michele*, 8vo., Rome, 1814; translated Perrault's treatise on the orders; and Chambers's *Civil Architecture*; and with Cicognara and Diedo, *Fabbriche più cospicue di Venezia*, 2 vols., fol., Venice, 1838-40. A portrait is given in GAMBA, *Gall. dei Litt.*, etc., 8vo., Ven., 1824. SELVATICO, *Archit. in Venezia*, 8vo., Ven., 1847, p. 473-8. DIEDO, *Elogio del prof. G. A. Selva*, 8vo., Ven., 1819. 14.

SELYMBRIA, in Thrace; see ÆTHERUS.

SELZER (.....), baurath at Eisenach, one of the best practitioners of his time. In 1839 he made a design for the complete restoration of the Wartburg. 68.

SEMA, tumulus, or sepulchre. The sema of Alyattes, king of Lydia B.C. 618-560, father of Croesus, had a *crepis* of large stones; above it a hillock, *choma*, of earth, and on the summit five pillars. It was north of SARDIS. The *sema* of Apries; of Amasis; at Sais in Egypt; of the Hyperborean virgins at Delos, are described by HERODOTUS. Priam covered the burnt body of Hector with the *sema*. 59.

SEME OF LIME; see SEAM.

SEME SANTO, Tracagnino, Arlecchino marble, or Virgin breccia. SEME SANTO di Setti Basi; see BRECCIA.

SEMECA (JOHANN), built 1233 the western part of the *dom* at Halberstadt, in which he was *dompropst*. 92.

SEMERIA (JUAN BAUTISTA Y JACOME), 1586, 1620; see el maestro B. ABRIL. 66.

SEMERK (HENRY), warden with John Wastell, master mason, completed 1513 the vaulting at King's College chapel, Cambridge, begun by J. HYLME and W. Vertue up to 1508. 19.

SEMERK (EDWARD); see SEAMER or Semerk (E.), at Windsor.

SEMERKE (HENRY). One of king Charles I's surveyors at Huntingdon, being paid £10 per annum fee. Harl. MS. 4706, p. 125.

SEMICIRCULAR ARCH. An arch springing from the impost. The north arch in the central tower of the abbey church at Malmesbury being narrower than the western arch is built of this shape. This form of arch cannot be made to stand without foreign support, even if the voussoirs be long enough, unless the thickness of the abutment be greater than one-ninth of the radius; BARLOW, in *CIVIL ENGINEER, ETC., Journal*, 1847, x, 211. The abutments should never be less than one-quarter of the span: intermediate piers in a series of arches may be one-eighth or one-ninth.

The round-headed arches in Garthorpe church, Leicestershire, are of XIV cent. work and not at all uncommon; ASSOCIATED SOCIETIES, *Reports and Papers*, 1865, lxi. 1. 4.

SEMICIRCULAR STYLE; see ROUND ARCH STYLE. SCOTT, *Lectures*, 8vo., London, 1879, ii, 178. ROMANESQUE. NORMAN.

SEMI-ELLIPTICAL. An arch formed by three centres; called by the Romans *forniceus compositi*. See SCHEAM ARCH; HANSE or hance. ELLIPTIC POINTED ARCH. OVAL BUILDING.

SEMINARIUM. GRANVILLE, *Guide to S. Petersburg*, 8vo., London, 1835, ii, 215. Glastonbury, S. Victor, and other houses, furnished seminaries or public schools held in the outer school, usually divided by a screen or wall to mark distinction of rank or attainments; Westminster school had a curtain. COLLEGE. SCHOOL.

SEMIS. A Roman measure of length; see ACTUS.

SEMITÆ. In the Grecian gymnasium there was at the back a large palestra or garden; on the one side was a long covered portico called *astylos*; the middle part was the place for the wrestlers, sunk two steps down, and having on each side the *margines* or *semita* to separate the public from the wrestlers. 1.

SEMNEH. A village in Lower Nubia, situated on the river Nile, and probably on the site of Tasitā, or of Acina. There is a temple on each bank, which have interesting crude brick works of defence of the time of Thothmes III, *cir.* 1800 B.C., the era of the erection of the temples. The temple on the left or west bank is about 30 ft. by 11 ft.; it is said to face the south, which is remarkable; another temple probably dedicated to Kneph is of a somewhat later date. Some thirteen short rock inscriptions dating Amenemha III, about 2000 to 3000 B.C., show that the river Nile rose about 27 ft. 3 in. higher than at present. HOSKINS, *Ethiopia*, ch. 18, p. 270-6. RAMÉE, *Manuel*, 8vo., Paris, 1843, i, 200. CAILLAUD, *Voyage à Mécro*, fol., Paris, 1823-7, ii, pl. 23-30. LEPSIUS, *Discoveries in Egypt*, 8vo., London, 1853, p. 268, 294; *Abth.*, iii, pl. 54. ZINCKE, *Egypt*. 28.

SEMNEIUM. A name, with *monasterium*, which EUSEBIUS states PHILO gave not to the habitations in Egypt but to the churches, some mistaking the terms as applied to monasteries in the modern sense. BINGHAM, *Origines*, 8vo., Lond., 1840, ii, 358; 365.

SEMPER (herr GOTTFRIED), born 29 Nov. 1803 at Altona; studied law 1822-5 at Göttingen, 1826 art. under Gaertner at Munich, three years at Paris under F. C. Gau; visited Italy and Greece, and on his return published *Vorläufige bemerkungen über bemalte architektur und plastik bei den Alten*, 8vo., Altona, 1834. He became professor of architecture at Dresden, where 1838-41 he erected the theatre in a cinque-cento style (burnt 1869), and published *Königliche hoftheater zu Dresden*, fol., Bruns., 1849; the splendid synagogue 1838-40 including the fittings and sacred vessels (*ALLGEMEINE BAUZEITUNG*, 1847, pl. 105-7); the Female hospital; Oppenheim palace; Gothic fountain in the Postplatz; Villa Rosa near the city (*ALLG. BAUZ.*, 1845, pl. 540-2; and *CIVIL ENGINEER, ETC., Journal*, viii, 197); 1846-8 the new picture gallery, completed 1855 by Hahnel and Krueger (*BUILDER Journal*, xiii, 479, 552); 1848 at Hamburg the house of the apothecary Semper (*ALLG. BAUZ.*, 1848, pl. 207-8). In all these he introduced colour decoration. He was architect to the king of Saxony. Having taken part with the insurgents in 1849 he fled the country, lived for a short time in Paris, and published *Ueber Polychromie und ihren Ursprung*, 8vo., Brauns., 1851; he then went to England, where 1852 he joined the Department of Practical Art at South Kensington; designed the certificate for the Art department; the bronze car for the funeral of the duke of Wellington (*BUILDER Journal*, 1852, x, 731); and 1853 made a rough sketch for the buildings on the present site of the South Kensington museum for which he was paid by the Prince Consort. He accepted the post of professor of architecture at Zurich university, in the upper town of which city he designed the Polytechnic schools, with the town hall; and the town hall at Winterhalter; 1867 designed the Swiss building at the Paris International exhibition; and 1869 was employed to rebuild his theatre at Dresden under the superintendence of his son. In 1869 he made a design for the exchange at Vienna; and he 1870 having selected a design by Hasenauer for the new museums on the Burg Ring, they together carried out a revised project. He also designed and erected the new hof schauspielhaus on the Franzens Ring with his colleague; and made material additions to the imperial residence, the hof-burg. Failing health induced him to live alternately at Venice and Rome, in which latter city he died 15 May 1879 aged 77. A monument in the Protestant cemetery was put up 9 June 1883.

SEMPER, *Der stil in den technischen, etc., Künsten*, 2 vols., 8vo., Munich, 1878-9; paper on *The Theory of Evolution in Architectural Ornament*, by L. HARVEY, at R.I.B.A., 15 Dec. 1884; *Proceedings*, p. 58-64, and *Transactions*, New Series, 1885, i, 29-54; and *Theory of Art*, *ARCHITECT Journal*, 1884, p. 243; 397; 414. LEPSIUS, *G. S. in seiner Bedeutung des Architekt*, 8vo., Berlin, 1880. H. SEMPER, *Gottf. Semper*, 8vo., Berlin, 1880. ROY. INST. OF BRITISH ARCHTS., *Sess. Papers*, 1878-9, p. 233. 68.

SEMPIER (... ..) of Bayreuth, was master about 1742 of K. von Gontard

SEMPLE (GEORGE), "engineer and architect" of Dublin, born about 1700, refers to his father as a building workman in 1675. In 1739 he set out on a business tour to Castlebar; 1749 designed and built the spire 103 ft. high to S. Patrick's cathedral, Dublin; 1749-57 built Patrick's hospital (WHITELAW, *Dublin*, 4to., 1818, p. 691); two houses in Capel Street for rev. Dr. Leigh; and one for Arthur Newburgh; a mansion for the archbishop of Dublin; and another, Ramsfort, Gorey, co. Wexford, for colonel Ram, destroyed 1798. In 1751 he repaired Essex bridge over the river Liffey after a severe flood, in ten days. After twice going to London to obtain information (almost uselessly) as to how to build a bridge, he laid 1753 the foundations of a new one; 1 Nov. 1754 the centres were raised; and 8 May it was opened after two years and 80 days (R. MACK was the mason); it was 250 ft. long by 51 ft. wide, five spans, one 46, two 41, and two 36 ft. spans; cost £20,661 11s. 4d. This work being done "with extraordinary care and diligence to the great detriment of his health whereby he is rendered incapable to follow business" the government granted him £500; 1 George III, 1761; *Liber Munerum Hibernia*, pt. 6, fol. 57. The bridge was rebuilt 1874 and is named Grattan bridge. He published *Treatise on Building in Water*, in two parts, 4to., Dublin, 1776; and Lond., 1780, 2nd edit., in three parts; *BUILDER Journal*, 1877, xxxv, 1217-9, gives it a careful criticism. He appears to have been consulted as to bridges over the rivers at Londonderry, Waterford, and Wexford; and to have left Dublin or died in 1782 or soon after. DUBLIN *BUILDER Journal*, 1860, 378. MALTON, *Views in Dublin*, 4to., 1794-5. 61.

His brother John Semple, bricklayer and rough mason, was with Henry Darley, stonecutter, and Hugh Henry, carpenter, the artificers at the erection 1781 of the custom house at Dublin, under James Gandon.

SEMZOFF (IVAN), written Seruzoff, in GRANVILLE, *Guide to S. Petersburg*, 8vo., London, 1835, ii, 103, with Geropkin were the only native Russians that appear to have profited by the study of architecture in Italy, for which purpose Peter I supplied funds about 1717. On his return he was employed in the two capitals on churches and other public edifices, among them was the church of S. Simon on the Fontanka at S. Petersburg. He died 1743 at S. Petersburg. STAEBLIN, *Original Anecdotes*, 8vo., Lond., 1788, p. 225; 299; 438. 68.

SENA and SENA JULIA. The ancient name of SIENA, in Italy.

SENACULUM or council chamber. "Senaculum (Lat.) vocatum ubi senatus aut ubi seniores consistent dictum ut GERUSIA (Gr.) apud Græcos; VARRO, *De ling. Lat.*, ed. Müller, 8vo., Göt., 1833, v, p. 61." The example at Pompeii, also called temple to Jupiter, is conjectured from its interior colonnade to have been hypæthral. In the senaculum or curia at Rome behind the formerly so-called temple to Concord, now to Saturn, the senate was wont to hold its permanent sittings.

SENA GALLICA, or Senegaglia; properly SINIGALLIA in the Papal States, Italy.

SENARIA. The Roman pipe the diameter of which was $1\frac{1}{2}$ in. or six quarters; when seven quarters it was *septenaria*, and rose to *vicenaria* or 20 quarters or 5 ins.

SENASSHELER. A stone squared with one face worked sloping, or askew, such as the set-off of a buttress, 20s. per 100 ft. *Fabric roll, Rochester Castle*, 1367-9, in *ARCHÆOLOGIA CANTIANA*, ii, p. 3.

SENATE HOUSE. GRANVILLE, *Guide*, 8vo., Lond., 1835, ii, 41, 54, describes the senate house at S. Petersburg. At Rome is the senatorial palace on the capitol; and the senate hall (SENACULUM) in rear of the temple to Saturn, formerly Concord. CAPITOL. PARLIAMENT HOUSE. COURT HOUSE. CAMBRIDGE.

SENATORIUM. The left side of the sanctuary in the basilica of the Latin church, opposite to the MATRONEUM, separated from the sanctuary by a balustrade (*cancelli*). 51.

SENAULT (GUILLAUME), was architect and "maitre maçon ARCH. PUR. SOC.

des œuvres du cardinal d'Amboise", at the building 1502-10 of the château de Gaillon, with J. Fouquet, and P. Fain of Rouen, and others. On 4 Dec. 1507 the three contracted to build the kitchens at 7 liv. 10 sols Tournois the toise. Senault was paid on Saturdays, 7 sous 6 deniers (about $3\frac{1}{2}$ d. Engl.) per day, his deputy 6 sous, and the workmen 2 sous. They were probably succeeded by Pierre del' Orme. DEVILLE, *Comptes de Dépenses*, etc., 4to., Paris, 1850, xiii, xciii, 319. DUSSIEUX, *Les Artistes français*, 8vo., Paris, 1856, liij. BORDIER ET CHARTON, *Hist. de France*, 8vo., Paris, 1860, ii, 122. LANCE, *Dict. Biog.*, 1872.

SENLIS (anc. Augustomagus, Silvanectes, Silvaneticum). A town near Beauvais, in the department Oise, in France. The castle, now in ruins, was flanked by two round towers; and the original walls which had 28 watch towers have 16 remaining, part of Gallo-Roman work. The gate tower dates in xi, xiii, and xv cents. The ex-cathedral, dedicated to Notre Dame, is small; it dates from xii cent.; burnt 1304 but not much damaged. The triforium is a gallery as wide as the aisle. The west front and south side of the south-west tower appears in *BUILDER Journal*, 1860, xviii, 281, by J. J. Laing; and the south window in DAVIE, *Arch. Studies*, fol., London, 1877, pl. 34. The spire is "of the purest xiii cent. work, unparalleled for the elegance of its proportions"; it remains complete and perfect, and is 211 ft. high. In 1846 the figures to the great gate had been restored by the sculptor Rabinet under the direction of the architect Ramée. The chapels in north aisle of the choir, in *BUILDING NEWS Journal*, 1865, p. 362; and VIOUET-LE-DUC, *Dict.*, s. v. Chapelle, p. 461-3. KING, *Study Book*, 4to., London, 1868, iii, 6 pl. CHABAT, *Fragments d'Arch.*, 4to., Paris, 1877, pl. 40-1. JOHNSON, *Early French Churches*, fol., Newc., 1864, two plates. CHAPUY, *Cathédrale de Senlis*, 4to., 1831. TAYLOR AND NODIER, *Picardie*, fol., Paris, 1835-48, iii, has several plates, with one of the ruins of the convent of Cordeliers, showing timber work. The collège de S. Frambourg has a church of xiii cent. 43 ft. high and without aisles. The church of S. Pierre, now used as cavalry stables, has a rich porch and xvi cent. tower; that of S. Vincent xii cent. adjoins a seminary. A public library. The theatre is in the xiii cent. church of S. Aignan. Near the town is the half-buried Roman amphitheatre called les Arènes; the podium and dens are of masonry, the rest cut in the hill-side: and the ruins of the abbaye de Chaly, having a xiii cent. chapel in good preservation. 14. 28. 50. 96.

The *hais* of Senlis was employed at Paris; it is from twelve to sixteen inches thick; BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 15.

SENNA BAYMAH. A furniture wood; see ANGSAHAH.

SENNAMAR, or Sinnimar (as in COSTE, *Arch. Arabe*, fol., Paris, 1839). An Arab architect, living A.D. 420-38. He built two castles in Arabia, one called Sedir, the other Khaovarnack, each of which was alleged to have been united by a single stone by the removal of which the structure would go to ruin. Noman Alaouvar, tenth king of the Arabs, put him to death. 3. 68.

SENS (anc. Agendicum, and Senones). A town in the department of Yonne, in France, situated on the river Yonne; there is a stone bridge of three arches designed by G. Boffrand; and another. The walls are partly of Roman construction; eight gates, several of which are very old; the great gate of Notre Dame was pulled down before 1850. The city was 1420 taken by king Henry V of England. It is the see of an archbishop. The cathedral, dedicated to S. Etienne, has been restored by Viollet-le-Duc. It was completed 1168 by it is supposed the William of Sens who died at Canterbury, and is a fine specimen of the transition to Gothic. The north tower, *tour de plomb*, end of xii cent., the south, *tour de pierre*, fell in 1269, was rebuilt 1535. The nave chapels and clerestory date from xiii cent.; transepts of good flamboyant, xvi cent.; in the north one is a celebrated round window, surrounded and supported by open work. 1360-62 important repairs were made to the roofs by Nicolas, master of the works, who 1377 received a

pension of 10 livres: 1468 S. le Mercier was master, succeeded by F. Nobis, who was replaced by A. Lusurier; 1489 M. Chambiges, master mason of Paris, built the croisée or transepts and two portals; he was there in 1497 and 1499 after which period he was acting by correspondence as consulting architect, being again present in 1506 (BERTY, *Les grands Architectes*, 8vo., Paris, 1860). The painted glass dates XIII to XVI cent.; the rose windows are by Jean Cousin of Soucy, a village close by; *Peintures sur verre de la Cath. de Sens*. The baldachino for high altar 1742 was by J. N. Servandoni. The treasury is very rich. In the tower are two of the largest bells in France, and a bourdon of 16 tons cast 1560. The maze was destroyed 1768 (GAILHABAUD, *Arch. du Moyen Age*, etc., 4to., Paris, 1850-9; and WILLEMIN, *Mon. Inéd.*, pl. LXXXIII, p. 53). A tomb, see PLASTERER. PEACOCK. CHAPUY, *France monumentale*, 53. VIOLETTÉ-LE-DUC, *Diet. Rais.*, s. v. Cathédrale, p. 348. *Servanderie du xii siècle*, etc., 4to., Paris, 1851; *du xv siècle*, 4to., 1854; *Les Carrelages émaillés*, etc., 4to., 1859. LABORDE, *Mons. de France*, fol., Paris, 1816, pl. 152-3; p. 208. DAVIE, *Arch. Studies*, fol., London, 1876, pl. 81, 84, 85.

The *officialité*, erected in the reign of S. Louis (1226-70) was restored 1860 by Viollet-le-Duc; the *salle synodale* for 800 priests, erected about 1245, is given in 6 plates in *Archives des Mons. historiques*; one bay in elevation, in SHAW, *Arch. Sketches*, fol., London, 1858, pl. 35: VIOLETTÉ-LE-DUC, *Diet. Rais.*, s. v. Fenêtre; NODIER ET TAYLOR, *Voyages pitt.* (Champagne), fol., Paris, 1843-45, gives plates of the Roman wall of the Motte du Ciar; of the walls of a Roman door therein, a postern door, porte Notre Dame, porte S. Antoine; a plan of the cathedral, the front, several of the details and of the rétable, a door, and the glass; stairs to the treasury; door of the ecclesiastical residence (Ren. Gothic), old hospital, old palais de justice; and of the church of S. Savinien, with a crypt of about XII cent., the most ancient in the town; ruins of the priory of the Enfourchure near Sens; with ruins at Launay, Neuvy Saltour, abbey church of Dilo, and Coulours. The château de Fleurygny, near Thorigny, was rebuilt 1529 on the site of one destroyed 1378 by the English.

The modern works are 1861 a bronze statue by Droz of the chemist Thénard; the college, public baths, theatre, hospital, seminary for priests, and public library and museum. PETIT, *Guide pitt.*, 12mo., Aux., 1847. TARBÉ, *Recherches hist. sur la ville et ses environs*. QUANTIN, *Not. Hist.* 14. 28. 50. 96.

SENS (WILLIAM OF). He is supposed to have been the master mason who designed or only completed 1168 the cathedral of his native town. When the choir of the cathedral at Canterbury had been burnt, the chapter advertised for assistance, according to the manuscript history, thus, "Convocati sunt artifices Angli et Franci . . . Willelmus Senonensis . . . vir admodum strenuus in ligno et lapide artifex subtilissimus, ad lapides formandos, tornemata valde ingeniose, formas quoque ad lapides formandos, his qui conveniant sculptoribus, tradidit." He commenced rebuilding the choir and presbytery with their transepts or chapels from 1175; and died 1178 from the effects of a fall, and was succeeded by the monk William the Englishman as recommended by him. MS. by GERVASE, temp. king John, in Cotton, *Vespasian B*, 2, 191, printed in TWYSDEN, *Decem Script.*, col. 1290, fol., 1632; translated in WILLIS, *Canterbury Cath.*, 8vo., Oxford, 1845; 26 photos., 1867, p. 35-6. DIDRON, *Annales Archæol.*, 4to., 1845. ARCHÆOLOGIA, ix, 113. SCOTT, *Lectures*, in *BUILDING NEWS Journal*, 1858, iv, 246; and BUILDER *Journal*, xvi, 100. DUSSIEUX, *Les Artistes franc.*, 8vo., Paris, 1856, p. 115. LANCE, *Diet. Biog.*, 1872. The *BUILDING NEWS Journal*, 1877, xxxii, 646, gives the choirs of Sens and Canterbury cathedrals.

SENTENCE on walls, or texts; see LEGEND. SCROLL.

SENTRY BOX (Fr. *guérite*). The enclosure placed for a guard before a royal or public edifice; also when guarding the ramparts of a fortress; or in guiding trains on and off the rails of a railway; in which the soldier or pointsman can have shelter during in-

clement weather. In England it is generally a mere timber affair painted white; but in some places on the continent, as at Antwerp, it has been incorporated with the architecture, being partly sunk in the wall, but sufficiently advanced to have a slit on each side so that the soldier can see three ways. ANNALES DE CONSTRUCTION, fol., 1855, pl. 8, gives *type de guérite de garde, chemins de fer du nord*. 25.

SEPIA or seppia. The best black pigment of the ancients. It was either a natural black earth or obtained from the blood of the sepia or cuttle-fish, from the Adriatic and English coast. It is of a powerful dusky-brown colour, working well in water, and being very permanent is used like bistre and indian-ink in drawing. It is not used in oil as it dries very reluctantly. 7. 28.

SEPIMENTUM. The Lat. term for a FENCE; the various sorts with their names are given by SMITH, *Diet. Antiq.*, s. v. Agricultura. 78.

SEPTA, OVILE, carceres, or cancelli. At Rome, in the campus martius was the *septa*, or enclosure (and in later times a stone building), for the voters electing the magistrates in the comitia centuriata and sometimes the comitia tributa. The comitia were gradually laid aside with the other forms of the republic. 78.

SEPTENARIA; see SENARIA.

SEPTIER (FRANCISCO GOMEZ), 1694 executed the works at the collegiate church of S. Salvador at Seville, on designs by J. Granados after the accident 24 Oct. 1679 (LLAMA); and who, then *maestro mayor arquitecto*, had with others to report on the mode of prosecuting the works (MORENO MELENDEZ). 66.

SEPTIZONIUM. The ancient Roman name given to a particular kind of structure; having either seven ranges of columns surmounted by a statue, or formed of three terraces or floors, and so called from the seven stripes or zones into which it was divided horizontally; such as the tomb raised by Julius Caesar at Albano, to Pompey the great (died A.D. 48). At Rome, the supposed mausoleum of the family of Septimius Severus (died 211); a large square structure at the south-east corner of the Palatine hill; it is known from the engravings by S. DU PERAC, *Vestigi*, 40 pl., fol., Rome, 1575, 1653, 1709; and GAMUCCI, *Libro quattro dell' Architettura*, 4to., Venice, 1565; 1588, p. 82; it was destroyed by pope Sixtus V (1585-90) who had the columns, with perhaps other materials, used at the Vatican: BURN, *Rome and the Campagna*, 4to., Cambridge, 1871, p. 180. There was another similar building near the Thermæ of Antoninus, at Rome, said to have been more ancient than the above. 2. 3. 25. 28.

SEPTUM. The name given to the low marble wall or balustrading which divided the nave of the ancient basilican church into three in width; inside the middle one of which were the clergy. The term is sometimes applied to the low wall around a tomb.

SEPTUM or Basilica Julia. This vast building, the seat of the centumviral courts, was in the forum of ancient Rome; it was discovered 1817-49 and found to be 300 ft. long fronting the forum and 60 ft. wide as far as excavated. It is situated between the temple to Saturn and that of Castor; and is said to have been consecrated B.C. 46 by Julius Caesar, completed by Augustus, in whose time it was burnt, and again A.D. 283 and 377; and restored by Diocletian; the upper parts were later used as a quarry. The pavement of red, yellow (giallo antico), and grey marbles in rows still remains. BURN, *Rome and the Campagna*, 4to., Camb., 1871, p. 115-7.

SEPULCHRAL BRASS. The burial of a person was often recorded in a church by incised lines in a stone slab. A fine example of one is in the mediæval court of the Crystal Palace, from the original in the école des beaux-arts at Paris; some of the earliest are of the XIII cent., at the close of which brass was substituted for the stone. BURGESS, *Incised Slabs and Pavements*, in *BUILDER Journal*, 1855, xiii, 304-7. *Incised Stones*, CHURCH *BUILDER Journal*, 1875, p. 28-34; 98-104; 146-150. A wood-

cut showing workmen making a brass, 1316, is given in *ARCHÆOLOGICAL Journal*, i, 301. It is stated that there are about 4,000 in England, and not more than 200 on the continent, 1231 to XVI cent.

A plate of LATTEN (or cullen, i.e., Cologne) from Flanders was from the early part of the mediæval age, inserted in the wall, floor, or gravestone, being engraved in lines with the effigy of the deceased, and filled in with red or black wax; sealing wax dissolved in spirits of wine, is now used. An inscription, coats of arms, and emblems, were usually added. Embossed brasses are rare, especially so early as the one dated 1458, to John Forters of North Leach, mentioned in *ECCLESIOLOGIST Journal*, iii, 31. Some brasses dating from 1208 are named in *BUILDER Journal*, 1856, xiv, 505; and one 1240 to a Trevilian among the Durham brasses; but the earliest brass extant in England is 1277 to Sir John D'Aubernoun in the church at Stoke D'Abernon, Surrey (not cross-legged, Edward I); another 1289 Sir Roger de Trumpington, in Trumpington church, near Cambridge; and Sir R. de Bures 1302 in Acton church, Suffolk; both cross-legged. The finest brass in England is that of abbot de la Mere at S. Alban's, who died 1396; it is Flemish work executed in his lifetime; but the brasses were mostly the work of Englishmen. The earliest of Flemish work in England are 1360 at S. Alban's; 1349, 1364 S. Margaret's, Lynn (the two best and largest brasses now extant); 1360 North Mimms, Herts; 1347 Elsing, Norfolk; and 1361 Newark-upon-Trent. A brass plate dated so late as 1625 is in S. Mary's, Nottingham; and others 1684-89.

The brass of Eliz. Harvey, abbess of Elstow, Bedfordshire, elected 1501, dated 15. .; and of Agnes Jordan, abbess of Syon nunnery, in Denham church, Buckinghamshire, are the only two known brasses of abbesses.

The only known brass in Scotland is in Glasgow cathedral. A few in Wales. Three in S. Patrick's cathedral, Dublin.

The Continent.—It is stated that there are in Belgium about 63 brasses, but they are rare; in S. Jacques at Bruges, is one to a Spanish family dated 1577; one at Amiens; a few at Aix la Chapelle; in Meissen cathedral; one at Seville; at Constance supposed to have been sent from England; a few at Funchal, in Denmark; and a fine one at Lubeck of two bishops, died 1317 and 1330. In Germany, about 100 brasses. At Nymegen, ch. of S. Stephen, a female effigy on copper with figures of the Apostles and coats of arms on smaller plates at the sides; Stralsund, in Nicolaikirche, 1354 (?). *WEALE, Brasses of Belgium*, 1849 (? published). *GAILHARAU, L'Arch.*, etc., iii, fol., pl. at end. *CREENY, Mont. Brasses on the Continent*, fol., 1885; 80 fac-similes; *BRITISH ARCHITECT*, 17 April, p. 185.

At Siena, is a bronze bas-relief by Donatello on the floor of the church, to Gio. Pecci, bishop of Grosseto.

Revived use of Memorial Brasses, *BUILDER Journal*, 1848, vi, 113; 130. *SOCIETY OF ARTS, Transactions*, iv, 5; and *ARCHER, On Engraving with reference to Mont. Brasses and Incised Stones*, read 1847; *CIVIL ENGINEER, ETC., Journal*, 1848, xi, 30-1. The brasses to sir C. Barry, R.A.; and to sir G. G. Scott, R.A., both in Westminster abbey, are among the numerous modern examples.

14 Supp.

It is stated that the dates on a brass by themselves are no criterion for contemporary costume or period of execution; *BUILDER Journal*, 1848, vi, 430. *PALIMPSEST*. Rev. H. Addington has a nearly complete collection of rubbings, *ASSOCIATED SOCIETIES, Reports and Papers*, 1881, lxxvii; and so has A. W. Franks, F.S.A. Arthur G. Hill, B.A., the British museum, and Society of Antiquaries, have large collections. (*HEEL-BALL*) *GOUGH, Sep. Monts. in Great Britain*, 3 vols., fol., 1786-96. *HAINES, Manual of B.*, 8vo., 1840; and 1861-3, two vols. (*MANNING*), *The Mont. B. of England*, 8vo., London, 1846; 1849; and review in *ECCLESIOLOGIST Journal*, 1846, vi, 174. *A Manual for the Study of Mont. B. with Catalogue of 450 Rubbings*, 8vo., Oxford, 1848. *WALLER, Mont. B.—xiii to xvi cents.*, 80 pl., fol., 1842. *BOUTELL, Mont. B. of England*, 8vo., 1847; fol., 1848; 1849. *CUTTS, Manual for the Study of Sep. Slabs, etc.*,

300 pl., 1849. *CAMBRIDGE CAMDEN SOCIETY, Illustr. of Mont. B.*, 1846. The introduction to *History from Marble* by DINGLEY, published by CAMDEN SOCIETY, 4to., 1867, gives a long list of works on Brasses and on Effigies.

COTMAN, B. of Norf. and Suff., 1819; enlarged edit., 173 pl., fol., 1839. *HARTSHORNE, Funeral Monts. in Northamp.*, Camb., 1840. *KITE, B. of Wiltshire*, 4to., 1860. *HUDSON, B. of Northamp.*, fol., 1853. *MAUGHAN AND FOWLER, Med. Mon. B. of the Diocese of Lincoln*. *BOUTELL, Sep. B. and their Art manufacture*, in *BUILDER Journal*, 1854, xii, 542; 569. *WALLER, On certain Church B. in Cheshire and Lancashire*, 3 pl., ii, Liver., 1848-63. *DUNKIN, M. B. of Cornwall*, 62 pl., 4to., 1882. *ADDINGTON, M. B. of Bedfordshire*, (109), in *ASSOC. SOCIETIES, Reports and Papers*, 1883, p. 77. *FRANKS, M. B. of Glouce.*, in *CHURCH BUILDER Journal*, 1879, p. 161. *B. of Notaries*, in *BUILDER Journal*, 1849, vii, 496. *HODGES, Sep. Slabs, etc.*, in *Durham*, 1884.

SEPULCHRAL CHAPEL; see MONUMENTAL CHAPEL.

SEPULCHRAL EFFIGY. A figure in relief placed on a stone, or on an altar tomb, or under a canopy, to commemorate the person buried. *DUGDALE, Antient Usage of Bearing Arms*, p. 43, states that the cross-legged (right leg crossing the left) figures represent those who went to the Holy Land: in Howden church is a figure of a lady having her legs also crossed. It is also stated that the cross-legs were discontinued when plate armour took the place of coats of mail. A list of "cross-legged knights" in the counties of Lincoln, Leicester, Huntingdon, and Bedford, is given in *ECCLESIOLOGIST Journal*, 1844, iii, 7-9: that of Robert duke of Normandy in Gloucester cathedral, dates 1134. In the north aisle of Gilling church, Yorkshire, "on a gravestone of black marble are two sculptures in low relief of Henry the last of the Boyntons, lords of Sudbury, and his lady; of this style, which is very unusual, there are a few other specimens in Richmondshire, all indebted to the extreme hardness of the marble in which they are cut for their present state of preservation"; *WHITAKER, Richmondshire*, fol., Lond., 1823, i, 69. Effigies of eight persons, Edward II to Henry VI, in Willoughby church, Leicestershire; *ASSOCIATED SOCIETIES, Reports and Papers*, 1868, cxvii. Of six, at Aldworth in Berkshire, of the de la Beche family. There are three fine cross-legged effigies of the Sherborne family in Mitton church, Yorkshire, died 1667, 1689, and 1693, carved 1699 by William Stanton, "lapidary of London"; otherwise perhaps the two latest cross-legged effigies are those of John of Eltham, died 1334; and another died 1360 in Acton church, Suffolk, query to one of the Bures family.

Sculptured effigies of abbesses are rare; *KING, Oxford Cathedral (Eastern)*, p. 21; one in Polesworth church, Warwickshire. *Position of the Lady on Tombs and Brasses*; *BUILDER Journal*, 1863, xxi, 512.

Effigy in tile, Lingfield church, Surrey; *ARCHÆOLOGICAL Journal*, vi, 177; and *BUILDER Journal*, xvi, 785. *SKELETON*.

GOUGH, Sep. Monts. in Great Britain, 3 vols., fol., London, 1786-96, and its elaborate introduction. *HYETT, Sep. Mem., Altars, tombs, Effigies, and Monts. in the County of North.*, fol., 1817. *BLORE, Mont. Remains*, 30 pl., 1826. *HARTSHORNE, Recumbent Effigies of Northamp.*, fol., 1867. *BOUTELL, Christian Monuments in England and Wales—various classes of Sep. Monuments, from the Normans to Edward IV*, 8vo., 1849; 1854; 1864. *BLOXAM, Glimpse at the Mont. Arch. and Sculp. of Great Britain*, 8vo., Lond., 1834; 1836; and *Certain Sepul. Effigies and Monts. in South Yorkshire*, 8vo., 1850. *BRINDLEY AND WEATHERLEY, Ancient Sep. Monts.*, fol., London, 1884.

LASINIO ET GOZZINI, Mon. Sepol. della Toscana, fol., 1829. *SALVIADI, Coll. dei Mon., etc., di Bologna*, fol. *GRANDJEAN DE MONTIGNY, Plus beaux tombeaux en Italie dans les xv et xvi siècles*, fol., 1813. *CICOGNARA, Mont. Sepol. di Venezia*, fol., 1858. *TOSI E BECCHIO, Sep. Monts. xiv and xv cents. at Rome*, fol., 1834-37; 1842.

SEPULCHRAL MEMORIAL. AVEBURY; BARROW; BRASS or SEPULCHRAL BRASS; CAIRN; CELTIC ARCHITECTURE; CENOTAPH; CHANTRY; CIPPUS; CISTVAEN; coffin stone tomb; COLUMBARIUM;

CONDITORIUM, or CONDITIVUM; CROMLECH; CROSS; CROSS-LEGGED or SEPULCHRAL EFFIGY; DRUIDICAL BUILDING; FUNERAL or MORTUARY CHAPEL; FUNERAL or MORTUARY COLUMN; HERMES or TERMINAL; HYPOGEUM; MACEIRA; MAUSOLEUM; MEMORIAL CHAPEL; MEMORIAL COLUMN; MONOLITH; MONOLITHIC CROSS; MONUMENT; MONUMENTAL or SEPULCHRAL CHAPEL; OBELISK; OPA; PYRAMID; SACELLUM; SARCOPIAGUS; SEMA; SHRINE; SLAB; STATUE; STELE; STONE HEAP; STONEHENGE; TABLET; TOMB; TUMULUS.

SEPULCHRE (Lat. *sepulcrum*). The term usually applied by the Romans to the place in which a dead body was interred; the modern name being "grave"; and over which is erected the TOMB. The Roman *sepulcrum* was any kind of place where the body was buried, or *Monumenta* (MAUSOLEUM). Conditivum or conditivum was a sepulchre under ground in which entire dead bodies were buried: a place fitted up with recesses or niches was a COLUMBARIUM; by the Greeks, the similar place was called a HYPOGEUM.

The publications on the subject are given under TOMB. SEPULCHRAL MEMORIAL. See also BONEHOUSE; CAMPO SANTO; CATA-COMB: CAVE; CELL; CHARNEL; CEMETERY; COFFIN; GRAVE; LOCULI; NECROPOLIS; MASTABAH; TOMB; VAULT.

SEPULCHRE or EASTER SEPULCHRE. An arch or recess in the north wall of the chancel, where in the Roman Catholic service was deposited the crucifix and the sacred elements at a special time, in commemoration of Christ's entombment and resurrection. Some were of timber and movable, and one wooden coffer has been found. "It has been first shown that, the mediæval Easter sepulchre was intended for the purpose of commemorating our Lord's entombment by means of a rubrical rite, which in exceptional instances approached very nearly to a mystery. Next, that the structure was a temporary wooden one, richly decorated with hangings, set on the north side of the chancel (sometimes having a tomb or recess as a nucleus), wherein was deposited, in England, the reserved Host with a cross, from Good Friday to Easter morn, during which time a light burnt before it, and a watch was kept in remembrance of the guard of Roman soldiers. And, finally, that the custom was in use in this country at least from the time of S. Dunstan to that of king Edward VI; that it was revived during the brief reign of queen Mary, and afterwards it ceased to be observed in the English church"; HEALES, *On Easter Sepulchres*, in *ARCHÆOLOGIA*, 1870, xlii, pt. 2, p. 263-308. GOUGH, *Vetusta Monumenta*, iii, is the mine from which later writers have dug their materials. *Journal of ARCHAEOLOGICAL ASSOCIATION*, 1845, i, 71-2. NOTES AND QUERIES *Journal*, 1 Ser., i, 318, 354, 403; ii, 270. M. H. BLOXAM, in *ASSOCIATED SOCIETIES, Reports and Papers*, 1871, p. 67-82. SANDERSON, 1767, *Antiq. of Durham Cath.*, gives account of the ceremonies. GODWIN, *De Presulibus*. DAVIES, *Rites of Durham Cath.*, 12mo., 1672, p. 15. OWEN AND BLAKEWAY, *Shrewsbury*, ii, 346, and cited authorities. WHITAKER, *Richmondshire*, fol., 1823, i, 5, very common; 104. BLOMEFIELD, *Norfolk*, 8vo., vii, 132. PUGIN, *Glossary*, s. v. 1. 3. 19. 23.

An interesting entry in the records of S. Mary Redcliffe church was first noticed in the *Minutes* for 1736 of the Society of Antiquaries; and WALPOLE, *Anecdotes*, 1762, 1st edit., i, 45, where a person named "Cummings" is stated to have given or carved 1470 a sepulchre with all its belongings as described; this name has got into other works. It is properly "master Canyng", as given in BRITTON, *Redcliffe Church*, 1813; *BUILDER Journal*, 1851, ix, 476; *ARCHÆOLOGIA*, 1870, xlii, 301.

In some chancels the founder's tomb served for the Easter sepulchre, as the fine one *cir.* 1370 in Irnham church, co. Lincoln; *ASSOCIATED SOCIETIES, Reports and Papers*, 1875, p. 9.

Sepulchres exist at:—

Lincolnshire; Navenby (where the chancel equals those of Heckington and Haxton); Heckington, *cir.* 1370; *Vetusta Mon.*, iii, pl. 31; LEWIN, *Lincoln Churches*; *BUILDER Journal*, 1852, x, 609. Lincoln; Early decorated, end of xiii cent.; *Guide*, 1865, p. 105, 109-10. SCOTT, *Lectures*, 1879, i, 304-5. KING, *Eastern Caths.*, p. 298-9. S. Andrew Horbling; *R. and P.*, 1882, xiv. Patrington on Humber; East Kirby. Northorpe; a small one.

Suffolk. Long Milford.

Nottinghamshire. Sibthorpe church; *BUILDER Journal*, 1858, xvi, 559b. Hawton, *cir.* 1370; *PLACE, Plans, etc.*, fol., Camb., 1845.

Derbyshire. Ashbourne church.

Leicestershire. Garthorpe.

Warwickshire. Long Hichington, Cubbington, Bilton, Withybrook.

Worcestershire. Meyssey Hampton.

Oxfordshire. Stanton S. John and Bampton.

Yorkshire. Patrington, *Churches of Yorkshire*, 1845; and *Journal of Arch. Association*, 1845, i, 72.

Norfolk. Northwold; an arched aperture into the sacristy; *Vetusta Monumenta*, iii, pl. 32. *Norw. and Norf. Arch. Journal*, iv, 120, 365. Norwich cathedral; an aperture in the head of the arch of the east bay of north choir aisle, by which the sepulchre could be watched from the gallery over the aisle.

Devonshire. Holcombe Burnell.

Middlesex. Stanwell, tomb to Thomas Wyndesor, died 1483, served as sepulchre, destroyed 1863; CAMDEN SOCIETY, DINGLEY, *History from Marble*, 1867, pt. i, p. 20-1 and plate; and GENTLEMAN'S MAGAZINE, 1793, p. 993.

In Scotland, there are a few large shallow-arched recesses moulded on the face and edges; as at near the east end of the north wall of Temple church, Midlothian; two others, nearly in contact, in the small ruined church of Criech, Fifeshire. Others near the ground, and only 1 ft. to 1 ft. 8 in. deep, occur also under the end windows of the transeptal chapels at Seton and Douglass, Haddingtonshire; Torpichen, Linlithgowshire; and Borthwick, Midlothian. MUIR, *Ancient Par. Churches*, 8vo., London, 1848, xxiii.

Foreign examples. An altar of the crucified, used in the ceremonials of Palm Sunday, was erected in the nave of S. Gall, round which the sick monks on All Saints' Day took their place.

Belgium.—Bourges. The most ancient xvi cent. is at Louvain; SCHAYES, *Hist.*, iii, 127.

Vieux Thann in Alsace, fine. GOLBERRY, pl. 35.

France.—Doullens church; NODIER ET TAYLOR, *Picardie*, s. v. Abbeville. Grenoble, Notre Dame; NODIER ET TAYLOR, *Dauphiné*.

Poitiers, and Thann; HUGO, *France*, iv, pl. 15.

S. Mibier (Meuse), S. Etienne church; PENNY CYC., s. v. Meuse.

The finest example is at Troyes, in the church of the Madeleine.

A sepulchre and Christ's resurrector, in ivory, xvi cent., is given in DU SOMMERARD, *Les Arts du Moyen Age*, fol., Paris, 1838-36, atlas, pl. xi bis.

Germany.—At Remagen; SS. Peter and Paul church; in south aisle a sepulchre with the seven weepers round the body of our Lord; with a good wrought-iron screen (p. 61).

Andernach; at west end of north aisle (p. 66).

Sinzig, in the north aisle is one with the seven weepers (p. 67).

Carden, S. Castor; in north aisle is one with figures (p. 74).

Münster-Maidfeld (? Meiland); at north of the north aisle, has the seven figures; of late Pointed date (p. 76).

Oberwesel, the Liebfrauenkirche; at west end of the south aisle, is one with the four Marys watching (p. 80).

Frankfort on the Main; the münster; south of the south transept is a good stone Entombment (p. 92).

Nuremberg, Holzschuher chapel; a recess on the south (of the nave?) is filled by a group of the Entombment (p. 111). Church of S. Giles; ancient chapel of S. Wolfgang (p. 112); WERN, *Cont. Ecclesiology*, 1848.

"Heilige Grab" in Mainz cathedral, Freiburg, and Frauenkirche at Rottlingen, and others; or in special chapels as at Schlettstadt, at Nuernberg in the churchyard of the Johanniskirche; and at Goerlitz, OTTE, p. 47-8.

The church of the HOLY SEPULCHRE; see DOME: ROUND CHURCH: JERUSALEM; with list of publications relating thereto; and VIOLETTE-LE-DUC, *Dict.*, s. v. Sépulture, 276. CUST, *Mosque of Omar el Sakhra*. HUBSCH, *All Christlichen*, etc., 1858, etc. *Proceedings of the Palestine Exploration Fund*, etc. DE VOGÜÉ, *Eglises de Terre-Sainte: and Temple de Jérusalem*, fol., Paris, 1864. Its imitations, etc., see LORETTO. SEGOVIA, in church of La Vera Cruz. THE TEMPLARS. Dijon. Neuvy S. Sépulture. Constance cathedral. Lanleff, côtes du Nord. Rieux Minervois, near Carcassonne. Metz. Laon. At Bruges, is the Jerusalem chapel, built by a citizen who had visited the Holy Land; at the east end of the nave is a cave-like copy of the

Holy tomb, into which one has to creep through a small hole; WEBB, *Cont. Eccles.*, 8vo., London, 1848, p. 6.

SEPULCHRE LIGHT. In the centre of the choir roof at Norwich cathedral is a small round hole, from which, possibly, hung the light of the Sacrament, the usual place of which was before the altar, and not above it. From hence at Easter, might the light have been let down to fire the great sepulchral light. The hole is not a forced one, but made when the roof was built; HARROD, *Castles, etc., of Norfolk*, p. 270. HOLE. EXCUBITORIUM. LOFT.

SEPULCRUM; see SEPULCHRE.

SEQUOIA SEMPERVIRENS. A tree growing in the same forests as the *S. gigantea*, popularly known as the Wellingtonia. On fallen trees 1500 annual layers have been counted. Planks of the sequoia are imported 12 to 18 ft. long, 3 to 6 in. thick, and 10 to 36 in. wide, occasionally 48 in., all free from knots and other defects. It has the warm tone of cedar (*CUPRESSUS*) without the strong odour. It has been imported from 1877 as a furniture and decoration wood, by A. E. Roberts, of Fenchurch Buildings, London, and now forms the entire freight of vessels of large tonnage. In the country of its growth, this wood, applied to numerous purposes, is in high repute for durability below, upon, and above ground. The burr wood, which is rare, resembles the *THUYA*, from Algeria.

SERAFINO (padre), designed the Jesuit college finished 1673 at Fano; its church was designed 1685-6 by (Carlo ?) a son of Gir. Rainaldi; AMIANI, *Memorie*, fol., Fano, 1751, ii, 299.

SERAI and SERAJEVO; see BOSNASERAI, in European Turkey.

SERAI. The Persian, Indian, and Tartarian term for a large edifice for the accommodation of travellers in Eastern countries. CARAVANSERAI is a place of rest for caravans. In Turkey it is generally called KHAN. The erection of such buildings was considered highly meritorious by Hindoos as well as by Mohammedans, who frequently endowed them with rents for their support. The serai at Bancorah, about 100 miles from Calcutta, was built by the government; an almost solitary exception. The serais at Futtehpoor were noble monuments of individual bounty and were liberally endowed; HAMILTON, *East India Gaz.*, 1828. The Azim Sahib Ka serai, in the province of Malwa, near Mandow, is one of the handsomest and most spacious of the serais of Hindostan—176 cells or compartments with two suites of larger chambers and is fortified; HAMILTON; FULLERTON.

SERAI, usually SERAGLIO. The palace of the emperor or sultan of Constantinople: Harl. MS. 3409 is a long description in Italian with a plan, signed 20th May 1665 by Alberto Bobonio, Sequolitano Polaccho. Haleh, or Aleppo, contains five serais or governors' palaces. In this sense the word is also applied to the houses of foreign ambassadors. 14.

SER-AK-SCHEH, in Nubia, on the river Nile. A plan and view of the ruins are given in GAU, *Nubie*, fol., Paris, 1822, pl. 65.

SERANCOLIN MARBLE. A modern marble obtained at Val d'Aure, Val d'or, or Vallée d'or, near Serancolin, at the foot of the Pyrenees. The marble has a grey yellow ground with red or blood-red veins. It was rare in 1770, and the quarry is said to be exhausted. It is liable to be stringy (*filandreux*); BLONDEL, *Cours*, 8vo., Paris, 1771, v, 160-2. The cornices and bases of the pedestals in the great gallery at Versailles are formed of it. Another variety has straight bands and in great fragments, of bluish grey, rosy, deep red, and yellowish colour; the same block often presenting great varieties. Thirty monoliths of it were used by C. Garnier in the new opera house at Paris. 5.

The very fine marble from Vilmai sur Lahn, in Prussia, obtainable in lengths of 16 ft., is like Serancolin; it is very useful and makes good shafts.

SERAPIS; TEMPLE to; Serapeion; Osiri-Apis. One of the Egyptian deities, the worship being introduced into Egypt from Sinope in Pontus. He is usually supposed to be the same as

ARCH. PUB. SOC.

Osiris; as Dionysus, Pluto, Ammon, Zeus, or Pan; and he is known as the judge of the under world. Isis was his wife. The head of Serapis is represented in many ancient works of art, his features are peculiarly mild and soft, but expressive of a mysterious resolve; the body is clothed, having a serpent twisted round it from the arms to the feet where the head rests, the tail having three ends terminated as a dog, lion, and a wolf; the space in between the rolls having animals on it; while on the head of the god is a basket. The earliest known figure of an Egyptian Serapis is figured in BIRCH'S edit. of WILKINSON, *Egyptians*, 8vo., 1878, iii, 87. GIBBON, *Decline*, 8vo., London, 1853, iii, 285-90, chap. 28. VITRUVIUS, I. ch. vii, states that the temple of Isis and Serapis should be placed in the great public square of the city. 14. 28.

A magnificent temple existed at Memphis (SAKKARAH), discovered 1850 by Mariette bey, dating about B.C. 378-340; at Canopus, a shrine and oracle; at Alexandria, a vast square mass of building, the temple standing on an immense platform on arches; described in RUFINUS, *Hist. Ecclesiastica*; the worship was abolished A.D. 390 by Theodosius the great. A new temple was built to Isis and Serapis in the Circus Flaminius at Rome 43 B.C., restored by Domitian after a fire in A.D. 80; reintroduced by Antoninus Pius 146, and magnificently adorned by Alexander Severus (222-35). The Iseion at Pompeii (ISIS); vestiges of a temple at Gaeta; at Berenice Troglodytica, on the Red Sea, 40 ft. by 100 ft.; at Sparta; Pozzuoli, remains 140 ft. by 122 ft., known in 1538 and rediscovered 1750; York, see *Guide* to Yorkshire Philosophical Society, 1874.

SERAVEZZA MARBLE, incorrectly Saravezza and Serravezza. The quarries, together with those of Monte Altissimo, near Pietra Santa in Tuscany, are now much worked for the very fine statuary marble. CARRARA MARBLE. It weighs 189 lb. per cubic foot. A white marble showing purple spots and veins has been called FIOR DI PERSICO, etc. VASARI, *Vite*, 8vo., Fir., 1846, i, 106-7. SOCIETY OF ARTS *Journal*, June 1, 1860, viii, 568 gives prices at the quarries. RAVACCIONE marble is obtained at Costa. The nero de Seravezza is veined with white. This marble was used XVI cent. for the pillars in the duomo at Pietra Santa; in S. Siro at Genoa, 1576, for the two columns to the entrance of each chapel; at Florence, in the choir of the cathedral 1569 by grand duke Cosimo I.: and in the mausoleum of the Medici. At S. Miniato near Florence, a thin slab of it (or of Pavonazzetto) fills a window on each side of the apse (or five windows); *Handbook*, 1861, p. 183 (ALABASTER). At Naples, the columns 1616 to the chapels of S. Carlo of the Benedictines and the red marble to the pulpit in the cappella Palatina, are from these quarries.

To obtain a white marble superior to that of Carrara, for use in the church of S. Isaac at S. Petersburg, a Tuscan company opened a new quarry at great expense.

Slates are obtained (1862) from the oolite beds at places near Seravezza; used for roofing; and for ceilings being placed in slabs of about a yard square, on beams or joists and afterwards plastered. LAVAGNA STONE.

SERBISTAN and Surbistan; see SASSANIAN ARCHITECTURE.

SERCOLLANE, also called Bertram's and Mylam's cement, patented June and July 1843, formed of 70 parts of peat, 30 of pitch or tar, boiled for three hours. An artificial stone is formed of 35 parts of peat, 35 of mud from the bottom of a river, pond, or canal, mixed with dry sand or gravel, heated as above and then moulded into blocks or slabs for paving. CIVIL ENGINEER, ETC., *Journal*, 1844, vii, 60.

SERDAUB. The Persian term for a subterranean chamber to which the inhabitants resort in very hot weather; WELLSTED, *City of the Caliphs*, 8vo., London, 1840, i, 75; 266. At Mosul they are lined with thin slabs of Mosul gypsum, and the walls are constructed of great solidity to support the buildings over; BONOMI, *Nineveh and its Palaces*, 8vo., London, 1852, p. 10. A secret narrow passage formed in the thickness of the wall of a *mastabah* or tomb, in Egypt. It has no entrance, and seems

Q

to be peculiar to tombs of the ancient empire, *i.e.*, period of the pyramid kings; and contains statues of the deceased of all sizes, in wood, limestone, and granite. Twenty statues of the priest Ti were found in the serdaub of his tomb; one is in the museum at Boulak; EDWARDS, *Up the Nile*, 8vo., London, 1877, i, 92.

SERDOPOL QUARRY of black granite, in Russia; see BRENNIA; S. PETERSBURG (99^a); and GRANITE, (77^b).

SEREGNI (VINCENTO), also a sculptor, was employed 21 July 1547 at the duomo at Milan, 22 Aug. 1562 was dismissed for negligence, but reappointed 11 Sept. of the same year. He designed the exchange (its entrance by G. Alessi); the church degl' Angeli; and was employed about 1564-6 at the church of S. Pietro at Rome. He died 1594 or 1598 at Milan, aged 85. FERRARI, *Dispareri*, 4to., Milan, 1771, p. 65, 72. His son Vitruvio also practised, and placed an inscription to his father in the church of S. Giovanni in Conca. 68.

SEREGNO (GIOVANNI DA), was engaged 14 Sept. 1399 at Milan cathedral.

SERENA; PIETRA; see MACIGNO STONE.

SERGIUS LEPIDUS. The arch 13 ft. 3.9 ins. wide in the opening, of the Corinthian order, at Pola, is now called porta Aurea or Aurata; SERLIO, *Archit.*, fol., Venice, 1663, p. 198-201. ALLASON, *Pola*, fol., London, 1819, gives two views and plan.

SERIANA, in North Italy, furnishes the Bergamasco breccia, a greenish ground with black and grey spots. BRARD, *Minéralogie*, 8vo., Paris, 1821.

SERINA (cav. PIRO LUIGI) "di Valenza", appears to be the same person as SCRIVA or SCRIVANO (L. P.), of Spain. 95.

SERINACUR; see SHRINAGAR, in Hindostan.

SERINGHAM; see SRIRANGAM, in Hindostan.

SERLIO (SEBASTIANO), born 6 Sept. 1475 (but 1518 by D'ARGENVILLE, copied by DE QUINCY and CALLET), at Bologna, son of Bartolomeo, a painter of ornament and quadratura, under whom he studied drawing and perspective. NAGLER, and WARING (*Crystal Palace, Italian Court*) state he was also a pupil of Bramante (1441-1514). The following account of Serlio is drawn up from the many various and conflicting memoirs of him. He commenced practice at Bologna in the residence of the gonfaloniere di Giustizia within the palazzo pubblico, where he built the fine tapering door leading to the sala of the senate; and the elegant window towards the Cantone dei Fiori: the chiesa di San Giacomo Maggiore; the present superb palazzo di Malvezzi Campeggi (but built 1530 by A. and J. Marchese il Formigine); also the façade facing the entrance from the piazza of the palazzo maggiore (BIANCONI, *Guida*, 1826); and the façade of the edifice which has served for a long time for the fish duty. At Venice, 1506 the interior of S. Sebastiano is attributed to him (façade 1548 by J. Tatti Sansovino, but is really 1523 by A. Scarpagni; SELVATICO, *Venezia*, 1847, p. 212); also the alteration of the Gothic church of S. Stefano, at Parma; its façade not completed, is also only attributed to Serlio.

The study of VITRUVIUS inspiring him with a desire of obtaining greater insight into the practice of the ancients, he travelled 1509-14; or about 1500 resided some time at Pesaro and 1514 went to Rome; or 1511-14 went to Pesaro (LANZI); then measured the ancient works at Verona and Vicenza, at which latter place he erected a timber theatre in a hall, given in his *Work*, B. II, edit. 1663, p. 76-9; went to Venice, where he designed about 1530 the church of S. Francesco delle Vigne in conjunction with J. Tatti Sansovino, and became acquainted with Sanmichele and Abondi. He there designed the magnificent timber ceiling of the biblioteca antica in the palazzo ducale, for doge Andrea Gritti (1523-38), said to be the only work, now known, by Serlio in that city (copied in the Italian court at the Crystal Palace), and given in 1663 edit. of *Architettura*, p. 356-71. Three palazzi for (by) the nob. Francesco Zen, are stated to be by Serlio. CARLEVARI, *Fabbriche di Venezia*, fol., Ven., 1703, gives (pl. 76) the palazzo Grimani on canal grande (by Sanmichele); (pl. 77) palazzo Bembo on canal grande; and

(pl. 37) the scuola di S. Rocco, as all by Serlio; the latter is now attributed to B. Buono 11 Jan. 1517, Sante Lombardo 1524, and A. Scarpagni 1527-30; its water façade alone is attributed by some to Serlio. VASARI, *Vite*, edit. Fir., 1846, ix, 265, note, states that Serlio was in Venice in 1534, where he might have found further employment under the doge Gritti had not his passion for exploring antiquities led him to leave for Istria and Dalmatia, measuring remains at Pola, Arsa, in all the Marches, and Umbria, and Spoleto, arriving at Rome in 1535 (edit. 1663, p. 124-5) at the time B. Peruzzi (died 1536) was at work with his two palazzi Massimi in the ruins of the ancient theatre of Marcellus. Serlio then measured many of the ancient remains (some of which no longer exist) and modern works in that city; and appears to have also visited Latium, Magna Grecia, Naples, and Calabria. On his return to Venice he began to publish the result of his studies in his work on "Architecture", being Books III and IV, 1537 and 1540, comprising the *Antiquities* and the *Orders*, etc., using various drawings given or left to him by Peruzzi together with some of his remarks. Ercole II of Ferrara, il marchese del Vasto, and François I of France, much praised him, the latter giving 300 scudi d'oro; the 3rd Book is dedicated to him. VASARI, *Lives*, edit. London, 1851, iii, 171, 516.

Invited by François I to France, through the influence of Primaticcio, he arrived with his family about the end of 1541, having been paid the expenses of the journey, and received 400 livres a year, with 20 sous per day when visiting the royal residences (CALLET, *Notice*, 1843, p. 125), and was lodged at the palais des Tournelles, at Paris. He is considered (by CLARAC, *Musée du Louvre*, 1841) to have designed that part of the Louvre facing the river Seine where commences the great gallery; the corps of the château du Louvre was carried out by P. Lescot, abbé de Clagny, Serlio having considered the design by the Frenchman as superior to his own (BRICE, i, 47). He then went to Fontainebleau, commenced 1534: CALLET gives a view of the side next the canal as by Serlio; and LANCE, *Diet. des Arch. franç.*, ii, 273, states that the works done 1540-47 by Primaticcio were those by Serlio. He devoted himself to the mere duties of his office, filling up his spare time by composing his great *Work*, of which Books I *Geometry* and II *Perspective* were published, 1545, in French by J. Martin, and in Latin; Book V, *Churches*, Paris, 1547 is dedicated to Margherita di Valois, the king's sister.

The king having died 31 March 1547, Serlio appears to have been superseded by P. de l'Orme, the protégé of Henry II, who gave him letters patent 3 April 1548 (CALLET, p. 128) and 29 Jan. 1548-9, to examine how François had been served at Fontainebleau, S. Germain en Laye, Villers-Cotterets, Verres, and the château de Madrid in the Bois de Boulogne, etc. (ORME, *Arch.*, p. 35). Soon after, Serlio on his way to Italy made a "solemn entrance" into Lyon, where he seems to have designed a "loge pour les marchands", and 1552 assisted at the entry of cardinal Tournon. He there also published Book VI *Libro straordinario*, 1551, with 50 or 77 plates of designs for porticoes, gateways, arches, etc.; the edit. 1619 gives 30 gates, 14 doorways, and 6 archways. He became rheumatic, and so poor as to be obliged to sell some of his MSS. and drawings to Giacomo Strada of Mantua, then in France, who published the seven Books with Book VIII, fol., Frankfurt am Main, 1575, a complete edition. Serlio then returned to Fontainebleau, and as usually stated died there 1552; CHARVET says about the end of 1554; D'ARGENVILLE, DE QUINCY, and CALLET (p. 130) state 1578, aged 60, miserably poor; and 1568 is given by NAGLER and WARING. G. Philandrier studied under him.

In his *Work*, edit. Venice, 1619, in Book VII, p. 74, he refers to a design by him for a house at Paris; p. 96 and 98 he states he was at Fontainebleau, Pesaro, Bologna, and Les Tournelles; p. 218 and 223 at Padua; 218 at Lyon: 197-201, roofs which are remarkable; "Thos. Eagles" in a note in a copy states "that Wren here obtained his idea for the Sheldonian theatre at Oxford": p. 152-158, 183-190, 192-4, query designs executed. In 1663 edit. of Book III are façades showing the use of the orders,

p. 224-5; 275-287; 305-7; 323-9; and 331-3; and Book v, p. 368-405, are twelve designs of various forms for churches.

Serlio's reputation now rests upon his writings; the *Work* was taken as the standard of taste by the French artists. P. de l'Orme, in his *Architecture*, lib. vii (fol. 202), referring to the Colosseum, wrote "C'est lui qui a donné le premier aux François, par ses livres et desseins, la connoissance des édifices antiques, et de plusieurs fort belles inventions, estant homme de bien, ainsi que je l'ai cogné, et de fort bonne âme, pour avoir donné et publié de bon cœur, ce qu'il avoit mesuré, veu, et retiré des antiquités." He was perhaps the first to use coupled columns. J. VREDEMAN in his *Architectura*, fol., Antwerp, 1577, names Vitruvius, Serlio, and the expert J. Androuet de Cerceau. FREART de Chambray, MILIZIA, and CHAMBERS, criticise his profiles, etc. AMORINI, 1841; and the *BUILDING NEWS Journal*, 1878, xxxv, p. 687-8, give a fairly complete list of the very numerous editions of the various Books. The edition of 1584 is perhaps the best. G. D. Scamozzi published *Tutte l'Opera*, 4to., Ven., 1600, the index to which is said to have been compiled by his son V. Scamozzi. The edit. fol., Padua, 1648 gives 30 plates of *Gates*; while Venice 1663 gives twelve, and has some additions by the editor to the text. The only English translation is *The First Booke of Architecture, made by Sebastian Serlio, entreating of Geometrie*, translated out of Italian into Dutch, and out of Dutch into English: Book II, Perspective, Scenes; III, Antiquities; IV, Rules for masonry, ceilings, letters, vases, shields; V, Forms of temples; fol., London, 1611, dedicated to Henry, prince of Wales, by Robert Peake.

There is no good memoir in English. DEZALLIER D'ARGENVILLE, *Vies*, 8vo., Paris, 1788, i, 114. BOLOGNINI AMORINI, *Elogio storico*, fol., Bol., 1823; and *Vite*, etc., 1841, p. 112-182. QUATREMIÈRE DE QUINCY, *Vies*, 8vo., Paris, 1830, ii, App. MUZZI, *Annali di Bologna*, 8vo., Bol., 1840-6, vii. CALLET, *Notice hist.—Arch. français*, 8vo., Paris, 1843. SELVATICO, *Arch. in Venezia*, 8vo., Ven., 1847. LANZI, *Storia*, v, 61. LÉON DE LABORDE, *La Renaissance des Arts à la Cour de France*, 8vo., Paris, 1850, iii, 161 and 165. ADAMS, *Descr. Inter. et Meubles des époques de Louis XIII et XIV*, fol., Paris, 1861-4. CHARVET, *Etude sur Serlio*, mentioned in LANCE, *Dict.*, 1872.

1. 3. 5. 14. 25. 34. 47. 68.

SERLO, abbot of Gloucester, after the fire of 1088, commenced a new church, completed 1100, and partly burnt two years afterwards. BRITTON, *Cath. Antig.* 19.

SERMINI (don Pedro), an Italian. The pleasure house called Riofrio near S. Ildefonso, for Elizabeth, widow of Philip V of Spain, was begun by V. Ravaglio, continued as far as the plinth by C. Fracchina, who was succeeded 1738 by P. Sermini, and he by G. Diaz Gamones. 3. 66.

SERNA (JUAN DE LA), of much merit at Madrid, 1613, lived in his own house in the postigo de S. Martin, and died there 23 August 1615, and was buried in the church of S. Felipe el real. 66.

SEROLI or SECREOLE. A village two miles from BENARES. SERPARELLO MARBLE, also serpentello and serpetrello. White with little tortuous red rays or streaks.

SERPENTINE, also OPHITE. An eruptive rock, a compound of diallage and felspar, or perhaps, rather of compact felspar with frequent transitions into diallage. Its chemical composition varies considerably; it is a mixture of silicate of magnesia and carbonate of lime, with minor quantities of oxide of iron and alumina; water is also a marked ingredient; to iron and chromium it owes its colour.

Taking the composition of serpentine and of olivine from the thirteen analyses of each by several chemists, such as are given by NICOLL in his *Manual of Mineralogy*, the similarity or difference would be as follows:—

	Serpentine.	Olivine.
Silica	41.99	41.92
Magnesia	40.24	46.67
Oxide of Iron	3.38	10.75
Water	12.68	

as given in ROYAL INST. OF BRIT. ARCHTS., *Sessional Papers*, 1853-4, p. 10, by Messrs. Brace and Colt who were the first to open quarries of any considerable depth. The "Penzance Serpentine company" opened quarries and established works at the Lizard; specimens were shown in the Exhibition of Industry in London in 1851; it supplied Kennoek serpentine, which is the steatite veined stuff; the company was wound up 1857. The "Lizard Serpentine company" opened quarries in 1854 (and erected a factory on the spot) at Poltesco near Helston, Trear, Long Alley, Holestrow, and the Signal Staff; it erected derrick cranes to quarries of from 40 to 50 ft. deep; the loose stone having been thrown over the cliffs, extensive beds of consolidated rock were reached, which are worked in the same manner as granite. The blocks previously varied from 2 to 10 ft., now the block has frequently to be broken before it can be removed; and 9, 10, or 12 ft. lengths can be obtained. The coloured and serviceable stone runs in beds varying from 4 ft. to 40 ft. wide, the blocks being of irregular form. The quarries were shut up in 1877 and reopened 1879; *BUILDER Journal*, 12 April. "Cornish Serpentine quarries" at Poltesco 1879 occurs. The stone was formerly supposed to be not only brittle in the extreme, but equally hard with granite; that from the lower beds loses its brittleness. Some of the rocks are hard, whilst others yield to the nail.

The prevailing shades are red, black, green, white, and yellow, blended in endless combinations and varieties, and mingled with sparkling crystals of diallage. The red is bright and blood-like, imparting a warmth of tone not to be obtained in any species of marble. The Lizard serpentine is distinguished from that obtained from other parts of the world by the variety and vividness of its colours and the interesting white lines caused by veins of steatite or soapstone, which is a source of weakness as on parting with the water the veins are liable to crack.

Much of the green serpentine from Connemara is very fine, variable in quality, and requires to be raised without gunpowder, which shakes it too much; WILKINSON, *Geology, etc. of Ireland*, 8vo., London, 1845, p. 42. The west of Mayo and Galway afford beautiful variegated green and white specimens. The green Connemara marble as it is called, is obtained at Ballinahinch in Galway, the most valuable quarries being situated at Clifden, from whence it is largely exported; MELVILLE, *Lecture at museum of Practical Geology*, London, 1860.

Precious or Noble serpentine, is translucent and massive, with a rich oil-green colour, of pale or dark shades; Sweden, Isle of Man, and co. Aberdeen.

Common serpentine, at Lizard and other places.

Picrolite, is a fibrous variety, somewhat resembling asbestos, but of a dark green colour.

Marmolite is a pale green colour, sometimes nearly white.

Retinalite, has a resinous appearance, in colour varying from honey-yellow to oil-green, and is translucent.

Green serpentine occurs at the Oned Madrage in Algeria; June 1875.

A green ground with small yellow or yellowish spots in long squares and crosses. Some with a brown-black ground and white spots.

Serpentino nero antico. Black ground, large oblong black spots.

Some of the porphyries with a green ground were called *ophites* by the ancients.

Serpentino antico, met with in Italy, is of a dark, dull green colour with whitish spots. It was called by the ancients *marmor*, *ophites*, or *memphites*, as it was obtained from Memphis.

The manufacture of articles of serpentine has long been carried on at Lobnitz in Saxony, and in Franconia.

HUNT, *Manufacture of British Serpentine*, in *ART JOURNAL*, Sept. (also July) 1855. *BUILDING NEWS Journal*, 1856, ii, 875; buildings named, 1865, xii, 16; 1867, xiv, 493; 1869, xvii, 211. *BUILDER Journal*, 1851, Irish, ix, 605; 1855, xiii, 334; 516. CIVIL ENGINEER, ETC., *Journal*, 1855, xviii, 424. PENNY CYCLOPEDIA, 2nd supp., 1858. BEARD, *Minéralogie*, 8vo., Paris, 1821, ii, 207. *HOUSEHOLD WORDS Journal*, Sept. 9, 1854, p. 233.

SERPENT WORSHIP. The serpent or dragon was one all-essential element of worship or fear, in all lands; and during the middle ages the serpent was an emblem of the evil spirit.

At Nayntivoe or Haartem, in Ceylon, is a Hindoo temple sacred to Naga Tambiram, or the god of serpents, in which are a number of Cobras de capello that are daily fed by the Pandarams. NAGA ARCHITECTURE. FERGUSSON, *Tree and Serpent Worship—in India—in I and IV cent. after Christ—from the Temples at Sanchi and Amravati*, 100 pl., 4to, Lond., 1869; with 46 pl. aldit., 1868. OWEN, *Essay to Nat. Hist. of Serpents* (including the Brazen, fiery, and worship), 4to, London, 1742. DIMOCK, *Notes on Genesis, etc., and on Serpent Worship*, 4to, 1804. DEANE, *Worship of the Serpent*, 8vo., 1830; enl. 1833. O'BRIEN, *Round Towers of Ireland*, 8vo., 1834. SQUIER, *The Serpent Symbol in America*, 8vo., New York, 1851. SIMPSON, *Hist. of the Parish of Adel*, 8vo., 1879. BUILDING NEWS JOURNAL, *Lecture*, 1869, xvi, 133-4; Dr. Phené, xxi, 1871, p. 117; and p. 313. MAGAZINE OF ART, 1883, p. 519, giving a fine bowl of Assyrian or Phœnician origin, from Palestrina. ROYAL INST. OF BRITISH ARCHTS., *Sessional Papers*, 19 May 1873. SNAKE HEAD MOLDING. 50.

SERRA (ANTONIO), born 1783, of Genoa, also an engineer, designed a large number of buildings in the Roman classic style, among which is the larger church at S. Marino. He died in 1847. 68.

SERRA GALLINA; see SINIGALLIA, in Central Italy.

SERRANO (don MANUEL), 10 April 1774, elected a member of the royal academy of S. Fernando; was director of the works at Aranjuez; designed a bridge at the end of the calle de la Reina up to the springing of the arches, when the works were stopped and a temporary way made of boards. He also designed the hospital of S. Carlos at Madrid, which was completed Jan. 1776. 66.

SERRATED PLAN of filling in between the additional ribs in vaulting; as at the presbytery at Ely, *cir.* 1240-50, and the four bays immediately to the west of the crossing in Westminster abbey, *cir.* 1280-1300; the latter more perfect as having level ridges. SCOTT, *Lectures*, 1879, ii, 208-10.

SERRATINI (GIUSEPPE ANTONIO), rebuilt about 1725 the church of S. Gregorio on the Celian hill, at Rome, designed *cir.* 1612 by Onorio Longhi. 12.

SERSEAU (..... DU), who is mentioned as "l'un des plus ingénieux et excellents architectes de son temps", in a posthumous work of MORIN, *Hist. gén. des pays de Gastinois, Sénois, et Harpols*, 4to., Paris, 1630, p. 20, and as the designer, *temp.* king Henri II, 1547-59, of the choir finished 1608 to the church at Montargis, is the elder Jacques ANDROUET du Cerceau.

SERTORIO (DOMENICO), son of the sculptor P. Sertorio, was chiefly employed at Lodi, where he modernised the duomo; designed the episcopal palace, and several houses. He died towards the close of the XVII century. 68.

SERVANDONY, usually Servandoni (cav. JEAN NICOLAS not Jean Jérôme), born 2 May 1695 or 1696 at Lyon, not 22 May 1695 at Florence, studied landscape painting under J. P. Pannini, and architecture at Rome under J. J. de Rossi. He travelled, painting decorations for theatres, at the opera at Lisbon, and for fêtes, for which he had given to him the order of Christ. In 1724 he visited France; 1728 obtained the direction of the decorations at the opera at Paris, which he held for eighteen years; designed the grande salle de machines (*Dictionnaire des Théâtres*, v; and BLONDEL, *Arch. franç.*, fol., Paris, 1752-56, iv, 90); 1730 fireworks on the Seine (engraved); 26 May 1731 elected a member of the académie des beaux arts; appointed architectural decorator to king Louis XV with a salary of 2,000 fr.; 1738 was greatly employed in painting scenery, and from that time devising representations, fêtes, and peace rejoicings, at Paris, 1745 Bordeaux, 1748 London; for the elector of Saxony; at Verona, Stuttgart, etc.

At Paris, he arranged for public festivals the *place* de Louis XV to be covered to contain 25,000 persons besides a large number in the area; this was not carried out; but after the competition of 1748 it was laid out 1753 by J. A. Gabriel, nearly on his plan: he also designed a *place* in front of the Louvre. In the competition of 1732 for a façade to the church of S.

Sulpice he obtained the first prize, and 1733-45 carried out the grand façade with large orders and its interior peristyle; completed 1777 by Chalgrin; BLONDEL, *Arch. française*, fol., Paris, 1752-56, ii, 37-42; PATTE, *Mémoires*, 293; 366: QUATREMÈRE, *Vies des Arch.*, 8vo., 1830, p. 285. LEGRAND ET LANDON, *Paris moderne*, 8vo., 1808, i, 124-6. Also he designed the gate of the hospice de l'enfant Jésus, rue de Vaugirard; the ingenious staircase to the hôtel de the cardinal d' Auvergne, rue de l'Université (designed 1708 by Lassurance); BLONDEL, i, 262, pl. iv: the circular isolated chapel at the hôtel de la Live, rue de l'Université; in the place de Ste. Sulpice, a large house with a grand staircase; at Gennevilliers, near Paris, the rotunda with twelve Corinthian columns "une glacière monumentale" for marshal de Richelieu; a fountain in the cloister of Ste. Croix de la Bretonnerie; at S. Germain des Prés, was engaged after C. Goussier; at Balaine, near Paris, a maison des champs; at Vaugirard, another for the priests of Ste. Sulpice; the parish church of Coulanges la Vineuse in Bourgogne; 1742 at Sens cathedral the baldachino for the high altar; at Lyon, design (not executed) for the high altar in the Chartreux (by Soufflot, as corrected in BLONDEL, A. F., iii, 153): a theatre in the château de Chambord for the marshal de Saxony: for Dresden, designs and model for a theatre, commenced under Augustus III but stopped by the war: at Bruxelles, a number of designs for very considerable edifices, as for the marquess of Leyde, and the hôtels d'Arenberg and d'Ursel; at Alost and Engliem; and for the court of Portugal; and in England, where for Frederick prince of Wales, father of king George III, he designed the gallery to the house designed by R. Morris for Thomas Wyndham, Esq., on the banks of the river Thames near Hammersmith (WOLFE AND GANDON, *Vit. Britannicus*, fol., London, i, 1767, pl. 29-30): many scenes for the opera; and painted a staircase, with Andrea, at Mr. Arundel's, corner of Burlington Street, afterwards Mr. Townshend's. 3. 5. 14. 25. 34. 68. 112. 113.

He painted a large number of drawings of ruins and views. It is stated he married in London; his wife's name is given as Anne Harriette Roots, and the first of eight children was baptised at Paris 14 July 1729, which may give an earlier date for a visit to England than above stated. P. A. de Machy; J. F. T. Chalgrin, and J. A. Morand, were pupils. Servandoni d'Hannetaire of Bruxelles, was a natural son. He died in great poverty 19 January 1766 at Paris, aged about 70. COQUEREAU, *Eloge de J. N. S.*, in GALERIE FRANÇAISE, No. 6. *Eloge in Nécrologie* of 1767, p. 93. BLONDEL, *Cours d'Arch.*, 8vo., Paris, 1771, i, 102; ii, 210, 274; iii, 267, 330, 347-8; vi, 511. JAL, *Dict. Crit. de Biog.*, 8vo., Paris, 1867, p. 1125-6.

SERVANTS' HALL. An apartment in large houses in which the servants have their meals and into which other under servants and tradespeople are invited. In houses of a higher class another room is provided for the women servants. The upper servants are accommodated in the steward's and housekeeper's rooms. The servants' hall should be near the kitchen and also near the back door; KERR, *The Gentleman's House*, 8vo., London, 1871, p. 231-2. "Here let me note a common defect, that we have of a very usefull room, called by the Italians *il tinello*; and familiar, nay almost essentiall in all their great families. It is a place properly appointed to conserve the meat that is taken from the table, till the waiters eat, which with us by an old fashion, is more uselessly set by in the meanwhile"; *Reliquæ Wottonianæ*, 12mo., London, 1651, *Elements*, etc., p. 261-2.

SERVER. A sort of trowel having a broad square end, and attached to the end of a long handle, used by plasterers in mixing up mortar, plaster, and cement on the board, and by which the "hawk" is served by the plasterer's boy. BEATER.

SERVI (CONSTANTINO and GOSTANTINO de'), born 1554 at Florence; was of a good family, and also a painter of the school of Santi di Tito. He travelled 1572 to Germany, 1578 Spain; 1579, 1585 Rome; 1586 Naples; 1600 France, and other places. About 1600-4 he partly conducted with M. Nigetti the works for the great capella de' Medici in the church of S. Lorenzo at

Florence; Cosmo II appointed him superintendent of all the commercial companies; also of the mosaic manufactory; and of the works at the gallery: about 1609 he was invited to Persia, where he was employed for about a year by the sultan. He went 1611 by invitation to England, where he was appointed by the prince Henry superintendent of buildings and machines with an annual stipend of 800 crowns; "M. Constantine, an Italian, architect to our late prince Henry" (died 1612) occurs in CAMPION, *Descr. of a Maske*, 4to., London, 1614, p. 4). Sent 1615 by the grand duke to the states-general of Holland, he made a design for a palace at the Hague; and returned to Florence to have the model made there (not executed). After visiting every European court, he returned to Tuscany to the service of the grand duke; and died 1622, as governor of Lucignano. GAYE, *Carteggio inedito*, 8vo., 1840, iii, 473-6. BALDINUCCI, *Notizie*, 8vo., 1846, iii, 207-29. 3. 25. 32. 33. 68. 113.

SERVIA (ONOFRIO DI), worked 26 March 1401 at Milan cathedral. GIULINI, *Memorie*, 4to., Milan, 1760-71, xi, 458. 27.

SERVIAN ARCHITECTURE. In XIV cent. it followed the forms of Constantinople, but later, polygonal towers were substituted for domes, the windows became long and narrow, and marigold windows were occasionally used, square pyramidal-headed turrets introduced; clearstories were frequent. The chapel of SS. Joachim and Anna, built by king Stephen Urosh; that of Zhichka Gicha; that in the palace of Kruskevitsk; but above all, that of Kruskevitsk built by S. Knies Lasar in 1380, are all eminent examples; near that place are no fewer than 35 churches of a similar style and of the XIV cent., now mostly in ruins. The material was usually brick arranged in various-coloured patterns. NEALE, *History of the Holy Eastern Church*, 8vo., London, 1851, p. 278-9.

SERVICE BOX. The lead box soldered to the bottom of a water cistern, over a water closet, into which the water flows on the ball cock being pulled and thence by a pipe into the pan. It requires an air pipe let into it to take off the air from the down pipe. Other contrivances are now supplied, which supersede this arrangement, such as the "regulator" to the apparatus itself, and also the "water waste preventor".

SERVICE PIPE. For gas, it is the pipe leading from the gas company's main to the meter. For water, it is the pipe into the house by which the water is delivered into the cistern from the water company's main; or, when the "communication pipe" required by the Regulations under the Metropolis water act 1871 has been fixed, it is the pipe from the "stop valve" (which is required to be fixed near the point of entrance of the communication pipe into the house) into the house, and delivering into the cistern. Under the above named "Regulations", every service pipe must, unless with the consent of the water company, if in contact with the ground, or if external to the house, be of lead, but may otherwise be of lead, copper, or wrought iron, at the option of the consumer, and every joint of such lead pipe must be a *plumbing* or *wiped* joint. The lead pipe, under the same "Regulations", must be of equal thickness throughout, of a size to be approved by the water company, and of at least the following weights:— $\frac{3}{4}$ in. internal diam. = 5 lb. per lineal yard; $\frac{1}{2}$ in. = 6 lb.; $\frac{3}{8}$ in. = $7\frac{1}{2}$ lb.; $\frac{1}{4}$ in. = 9 lb.; 1 in. = 12 lb.; $1\frac{1}{4}$ in. = 16 lb. These weights are known as "extra strong". The ordinary service pipes of the trade, and which may be used for services from the cisterns, may be of the following weights:— $\frac{1}{2}$ in. internal diam. 4 $\frac{1}{2}$ lb. per lineal yard; $\frac{3}{4}$ in. 7 $\frac{1}{2}$ lb.; 1 in. = 10 $\frac{1}{2}$ lb.; $1\frac{1}{4}$ in. = 14 lb.; $1\frac{1}{2}$ in. = 18 lb.; 2 in. = 24 lb. The freezing of the service pipe in this climate may be prevented by laying it at a sufficient depth, say 2 ft. under ground; and also by protecting it along the walls by a casing stuffed with sawdust, felt, or sand. The service pipe is now often laid in the street in a wood trough filled in with pitch or asphalt. LEAD (effect of water on). PIPE. Haines' patent lead encased block-tin pipe, 1870.

SERVICE TREE; see PYRUS.

SERVING ROOM. In a mansion or club, a small room used

ARCH. PUB. SOC.

as a sideboard or buffet, where articles likely to be asked for at a dinner, but not in instant use, are placed; where fruit, etc., is arranged previously to dinner; and where the servants can deposit the relays of courses at the dinner. When the kitchen is in the basement a dinner stair and a lift are desirable. A hot table, a dresser, perhaps a table also, and a fireplace, a lead sink, and washbasin will often be found useful. A Butler's Service room for wine, glasses, plate, with a dresser and closets, is useful in large houses in addition to the Dinner serving room. In small houses the butler's pantry or the ladies' own pantry is useful as the serving room. KERR, *The Gentleman's House*, 8vo., London, 1871, p. 223.

SERVITES. The regular clergy of Servites was a branch of the Augustinian order. Most of the churches belonging to this order are of Gothic architecture, with abundance of cinque cento tombs and paintings of about the same age.

SERVITUDES; see EASEMENT (AJSIAMENTUM or convenience, probably the origin of this word); BUILDING LAWS. DALY, *Revue Générale*, viii, 274, 335-8; ix, 225, 294, 451; xi, 226, 379; xii, 149; xiv, 107.

SESSA. A town in the province of Terra di Lavoro in southern Italy. Numerous Roman antiquities remain. It is the see of a bishop. The cathedral dedicated to S. Pietro is a handsome edifice, having a tolerably complete presbyterium; Nesbitt, in *ARCHÆOLOGIA*, 1867, xl, pt. 2, 208. There are also five parish churches; several monasteries of which that of S. Giovanni in Carbonara is the most remarkable; and the usual public institutions. UGHELLI, *Italia Sacra*, vi, 531. ROSSINI, *Voyages Pitt.*, 1839, pl. 61. 50. 68. 96.

SESSIONS HOUSE. A building erected for the justices of a county or other district which has a separate commission of the peace, for the execution of the orders conferred by the crown by that commission and others created by act of parliament. As at Clerkenwell for the county of Middlesex 1779-82 by Thomas Rogers; RICHARDSON, *New Vitruvius Britannicus*, fol., London, 1802-8, i, pl. 34-7.

SESSORIUM PALATIUM. The remains of an extensive building near the church of Sta. Croce, at Rome. A court of justice and place of execution of slaves; the remains of a tribune. BRAUN, *Ruins, etc., of Rome*, 8vo., Brauns, 1854, p. 48.

SESSPOOL, now usually written CESSPOOL.

SESTO (GEROLAMO), *cir.* 1600, made a design for the façade of Milan cathedral; that of P. Tibaldo being accepted. 27. 68.

SESTRI; see SEGESTE, in Sicily.

SESTRI (fra OLIVIERO DI S. ANDREA DI), 1262 built at Genoa, the palazzo della Compera (the celebrated bank) di S. Giorgio, enlarged 1293, 1368, and 1407, restored 1535, and enlarged 1571 as the dogana or custom house; the hall, now *long room*, was one of the finest saloons in the world (GENOA).

SET; see SETTING COAT.

SET. The slight deviation from the horizontal which girders and beams may have when loaded to the full strain for which they are intended; or, after having been subjected to the necessary proof of a load double that which they are intended to permanently sustain. PERMANENT SET.

SET-BACK HINGE, used to make shutters fit close to the windows when shut, and to throw them back close to the wall when open. PARLIAMENT HINGE.

SETIDAVA. The ancient name of Posen or POZNAN, in Poland, now in Prussia.

SETIGNANO; see SETIGNANO, in Tuscany.

SET-OFF; or set-back, or offset. The Scotch term is SCARCEMENT. That part of the top of a wall, etc., which is exposed horizontally when the portion above it is reduced in thickness; as a 9 in. on a 14 in. wall. A plain or moulded DRIPSTONE over an opening, often small, and the ends returned or supported by a head or other carved work. The mouldings and slopes which divide buttresses into stages. SENASSHELER.

SETON (ALEXANDER), fourth son of lord George Seton V; 1598 created lord Fyvie; 1606 earl of Dunfermline; and 1604

lord chancellor of Scotland. KINGSTON, cont. of MAITLAND, *House of Seytoun*, 4to, Edinb., 1829, p. 63, states that Alexander who "was well versed in the mathematics and had great skill in architecture and heraldry"; 1613 built Pinkie house, Edinburgh, according to the date upon it: added to Fyvie castle which was purchased 1596; of this building BILLINGS writes "he probably employed an architect from France to adorn the rude towers of his new domain". Minor edifices at Elgin and elsewhere were also erected by Seton, who died in April 1622, aged 67. BILLINGS, *Baronial Antig.*, 4to, London, 1848-52. INNES, *Scotland in the Middle Ages*, 8vo, Edinb., 1860, p. 317. *Modern Scotch Architects, temp. James VI.*, by ROBERTSON in *Transactions of Architectural Institute of Scotland*, 1851, i, 55-67; *BUILDER Journal*, ix, 53.

SETS or paving sets. The term for the stone roughly squared ready for setting in paved roadways. They are now usually made 3 in. by 7 in. and not less than 9 in. or more than 18 in. in length. 4 in. by 6 in. was the usual "half sovereign". PITCHING. WELSH GRANITE. SOVEREIGN.

SET-SQUARE. A triangular instrument used in drawing, two sides being at right angles while the third is made to any required angle, as 45°, 60°, 67½°, and so on. They are made of pear wood, framed mahogany, ebony edged, and vulcanite, which latter are very hard, keep true, and will bear washing.

SETTE BASI. A marble, white veined with red and mixed with several other colours. Seme santo de sette basi; a breccia formed of fragments of seven colours. Seme santo or virgin breccia; very small red, chocolate, brown, bluish, white, and yellowish angular fragments. It is very rare and found only in small fragments at Pompeii.

SETTEE. The term sometimes given to the stone bench outside a house, as at Florence; and its imitation of one at Segovia. BENCH TABLE STONE.

SETTER. The mason who sets worked or wrought stones, in contradistinction to the "waller" who builds up the rubble or backing of the wall. ROUGH SETTER. MASON.

SETTIGNANO and Setignano. A village in Tuscany.

SETTIGNANO (ANTONIO DI GIORGIO DA). A favourite of Ferdinand I of Naples, where he strengthened the walls of the castle of S. Elmo, or of S. Martino; superintended all the public buildings of the kingdom and managed all the most important affairs of state. He died about 1490 in that city, and was buried with honours becoming a prince. He invited there A. Ferucci da Fiesole. VASARI, *Lives*, 8vo., London, 1851, iii, 100.

SETTIGNANO (LUCA DA); son of Jacopo di Bartolommeo da Settignano; see FANCELLI (L. DI).

SETTING (Fr. *enchevâture*). The bedding, laying, or riding, of one work upon another. PITCHING or paving. The term for building up of fronts with ashlar, architraves, facias, etc. 4.

SETTING of lime, cement, and concrete. "It is that which imparts initial energy to any mixture of mortar or concrete and enables it to eject or eliminate the superfluous water not required for its ultimate hardening. It means the operation which continues until the mass has lost its plasticity and cannot be moved without fracture. The duration of the process depends entirely on the quality of lime or cement used, and may extend from a quarter of an hour to six days or even longer. Hardening or ultimate induration is the process which follows setting, and may continue for years"; REID, *Treatise on Concrete*, 8vo., 1869, p. 47-66. The cause of setting is said to be still unexplained satisfactorily; the theory of the absorption of carbonic acid as usually stated is now given up. The setting of mortar is described by VITRUVIUS, II, v. C. H. SMITH, *Something about a Hod of Mortar*; *BUILDER Journal*, 21 Jan. 1865.

WINKER, *Theory of the Hardening of Portland Cement*, commented on by FEICHTINGER, who considers that "the hardening results from the formation of chemical compound of lime and silica, or lime and a silicate. If made up with a strong solution of carbonate of ammonia no hardening takes place, even when the excess of ammonia is washed out in consequence of the lime

becoming converted into carbonate; but if some hydrate of lime be added, the cement hardens, as well as fresh cement." If the cement briquette takes the impression of a finger-nail after two hours, when kept in air, it may be considered slow setting. The heaviest and strongest cements are generally, though not uniformly, the slowest; GRANT, *On Portland Cement*, in *INST. OF CIVIL ENGINEERS*, 1879-80, lxii, 104. JOHNSON, *Remarks on Cement-setting*, in *BUILDER Journal*, 1858, xvi, 258.

SETTING BOARD. Used by the glazier, is that on which the ridge of the lights is worked, and divided into squares, and struck out with a chalk line, or drawn with a lath, which serve to guide the workman in glazing lead lights. 1.

SETTING COAT. The finishing coat of plastering. Thus ceilings are "set" in two different ways; the best where the setting or last coat is composed of plaster and lime putty, commonly called gauge stuff. MORTAR. Common ceilings are finished with plaster without hair, as in the finishing coat for walls set for paper; to this work sometimes a little silver sand is added. "Set fair" is the last coat made particularly smooth by being well trowelled, especially when required for painting or colouring. Plastering on brickwork is "render set", if of two coats; render float and set if of three coats for superior work. 1.

SETTING KNIFE. Used by the glazier, being a blade with a round end, loaded with lead at the bottom of the blade, and having a long square handle, the square end of which serves to force the squares home tight in the lead. Being loaded with lead it cuts off the ends of the leads or comes with greater ease in trimming. 1.

SETTING MAUL, or MALL. The rammer used in paving.

SETTING-OUT ROD. Where work is spaced at regular or irregular intervals, as framing, or as dentils and ornamented work, a rod is prepared with the spaces or centres marked on it, which applied to the part is readily transferred by a chalk line or scratch from a tool, and so repeated as often as may be necessary. The stone of Prior Birde's chapel at Bath 1515 was coloured over with black paint and then stencilled for carving; some still incomplete.

SETTING-OUT WORK. The marking on the ground the exact places where the walls and projections of the proposed superstructure are to come. HASKOLL, *Arch't's Guide*, 8vo., 1868, p. 20; and *Railway Guide*, 8vo., 1848, pt. 2, p. 61.

Irregularities in Greek work; as shown in plan of columns at Basse; DONALDSON, in STUART.

Of a Norman cathedral, WILLIS, *Chichester*, 1861, p. 32-4. Of vaulting in olden times, WHEWELL, *German Churches*, 8vo., London, 1842, p. 182. Of a church, see Orientation.

SETTLE (Fr. *chénneau*; *cultière*). A northern term for a gutter or rather channel, which takes the water from the down-pipe into the kennel. RUN CHANNEL.

SETTLE; perhaps derived from "seat all people". A long seat having a high back and arms, used in a chimney corner. "A long settell", CHETHAM SOCIETY, *Coucher Book of Whalley Abbey*, iv, 1259. "Lang settle" is used in Yorkshire; ARCHÆOLOGIA, 1814, xvii, 150. An original example of the time of Henry VIII remains in the (now) "Green Dragon" public-house, at Coombe S. Nicholas, Somersetshire; TURNER AND PARKER, *Domestic Architecture*, 8vo., London, 1854, iii, 112, 339. Settle with high back, ASSOCIATED SOCIETIES, *Reports and Papers*, 1878, p. 269. BENCH TABLE STONE.

SETTLE or SETTLING OF WORK. The action which takes place in walls and other parts of a building after the work is put together. Formerly a wall was allowed to rest or settle at regular periodical intervals, before additional superincumbent weight was placed upon it. But now, heavy girders are unduly placed upon piers while quite green. SHRINKAGE.

SETTLEMENT. (Fr. *affaissement*; *tassement*). The distortion or disruption of the parts of a building produced by the unequal compression of the foundation; or by the shrinking of the materials of which it is built; or undue weight brought upon them.

SEVALLA. A Hindostanee term for a temple; KITTOE, *Indian Architecture*, fol., Calc., 1838, at end.

SEVEGNO (VICENZO); see SEREGNI (V.).

SEVEN. The number seven as used in building; see PROPORTION by numbers, etc. FERGUSSON, *History of Arch.*, 8vo., London, 1867, ii, 107, notices "the favourite number for a complete ecclesiastical establishment was 7, as in Greece, and Asia Minor, at Glendalough, Cashel, Scattery, and Innis Caltra in Clare, Tory island, Donegal, Rattoo in Kerry, Inchclorin, Longford, and Arranmore in Galway." Temple dedicated to the Seven Spheres, at Birs Nimroud (i, 140). SEPTIZONIUM. 1.

SEVERALL TABLE; SEVERANS, Severonne; Severonde. A mediæval term perhaps from Fr. *severonde*, or *seuronde*; the eaves of a house; HIGINS, *Nomen*, 206. The stones of a common gable coping; or a kind of water table or cornice. 16. 17.

SEVERANCE. When a railway or canal is made across an estate or field the owner is entitled to compensation for permanent damage thereby caused to his property by being severed; his claim is sometimes met by building a bridge across the railway or canal. COMPULSORY SALE. CONSEQUENTIAL DAMAGE.

SEVERE and SEVERITY. These terms are applied in all the arts to the taste, style, or manner, in which the work is conceived and executed, and it is frequently applied to the work itself. The "severe style" is that which admits only what is essential, and neglects all forms or accessory ornamentation from which would result an impression of variety, wealth, or luxury. "Severity" in architecture is the result of great simplicity in plan, great uniformity in elevation, and also in a very sparing use of ornament; and it is in this last perhaps that severity is most usually understood. Uniform masses of large plain surfaces, great rectangular buildings without projections or breaks giving a character of great solidity, for instinct even without reasoning teaches that time and destruction will affect less what is simple than what is composite. 25.

SEVEREY, severy, severe, severye, civer, civeré, civeres, and le civers and les civerys of WILLIAM OF WORCESTER, *Rin.*, p. 302. "The space or division in vaulting made by two arches, springing from two side walls, in which are windows and an open space in each of the other two. They are connected like vertebrae, and would stand independently of each other. This construction originated in xv cent."; DALLAWAY, *Discourses on Arch.*, 8vo., London, 1833, p. 175. COMPARTMENT. BAY. GERVASE, 1299, 15, says "thus each compartment of a vault resembles a ciborium in usual acceptance, and may be so called"; to which WILLIS, *Arch. Nomenclature*, 4to., Camb., 1844, adds "Severy and Severye are apparently therefore corruptions of CIBORIUM". The contractors for the "vawte" of King's College chapel, Cambridge, were to be paid £100 "for every severy" in the said building. 1. 16. 17. 19.

SEVERINA (SANTA). A town in the province of Calabria Ultra II, situated on a steep rock near the right bank of the river Neto. It has a castle, a cathedral dedicated to Sta. Anastasia, virgin and martyr, three parish churches, and other usual buildings. 50. 96.

SEVERINO (SAN). (Anc. Decemon; Septempeda). A town near Macerata, in Central Italy, situated on the river Potenza. It is the see of a bishop. The cathedral or duomo nuovo, dedicated to S. Severino, is since 1821-27 in the old church of S. Agostino. The church of S. Francesco is very old; that of the Castello; S. Lorenzo with a crypt, very old; COLLIO, *Chiesa Sott. di S. Lorenzo*, Macerata, 1838; Dominican church, restored xvii cent. by fra Giov. da Palermo; the small church della Stella, near the city, 1519 rebuilt, and endowed, by and at the expense of F. Mormando, architect. There were about seven monasteries and three convents. The grand piazza opposite the bridge, 1360 and xv cent., 725 ft. by 180½ ft. within the colonnades, was completed xvii cent. by fra D. Paglia. The theatre (of the palazzo municipale) by J. Aleandri. CALINDHI, *Saggio del pontificio stato*. 28. 50. 96.

SEVERUS and CELER, were employed after the confagra-

tion at Rome A.D. 64 to build the *domus aurea* for the emperor Nero, who is said to have opened in 67, with a golden spade, the ground for the canal, commenced by them from lake Avernus to the river Tiber at Ostia, but soon suspended at his order; the only portion completed was that now called the Lago di Licola; TACITUS, *Annales*, xv, 42, 43. 3. 14. 59.

SEVILLA (fra JUAN DE), by command of fra Fernando, founder and prior of the monastery at Guadalupe, is supposed 1405 to have designed and executed the work; he was succeeded by fra Diego de Paris 1483; G. Hernandez, and P. Talavera 1488. 66.

SEVILLA (Gr. and Rom. *Ispalis* or *Hispalis*; and *cir.* B.C. 45 Colonia Julia Romula; Ital. *Siviglia*; Engl. *Seville*). The capital of the province of the same name, in Spain, situated on the river Guadalquivir over which is a rude bridge of boats, and one of iron begun 1845 (one of stone was designed 1824 by S. Perez). The quays or promenades are said to be the finest in Europe. The Roman and Moorish walls are about 5 to 6 miles in extent, having 166 towers and 15 gates, that of Triana 1586 is by J. de Herrera. The plaza Encarnación was laid out 1824 by S. Perez. The *alcázar* built on the site of the palace of the Roman prætor by Jalubi of Toledo for Abderrahman or prince Nazar (1180-1225) was enlarged 1353-64 as a palace by don Pedro with the aid of Moorish workmen (el maestro HALI); 1550-52 was restored by L. de Vega; and J. de Minjares, who about 1583 was succeeded by J. de Orea; 1590 M. Infante was director of the works; and it was restored later. The sala de los Embajadores is as fine but not so delicately worked as the Alhambra; it is 45 ft. square and 135 ft. high, with marble pavement, tiled dado, and good gardens. LLAGUNO, ii, 7. PONZ, *Viage de España*, 8vo., Mad., 1787-94, ix. D. J. B. y M. de L., *Guía para visitar el Alcázar*, 16mo., Sev., 1858. In one room are the Roman antiquities found at ITALICA; a plate of bas-reliefs and terra-cotta is given in the Spanish Government work, *Monumentos arquitectónicos de España*, fol., 1859, etc.

The houses are generally of three stories surrounding a *patio* or colonnaded court; that of the casa de Pilatos, the palace of the dukes of Alcala, now Medina Celi, is shown in the S. G. work; the state rooms of which building have the walls 20 ft. high lined with *azulejos* or tiles of beautiful patterns; about 1780 the house was remodelled by L. Cintoria. In the palace de las dueñas the doorway (a mixture of three styles) of the chapel is given in S. G. work. Thirty public fountains are supplied by an aqueduct, caños de Carmona, formed principally by Ferdinand and Isabella, having 410 arches; and the fuente del Arzobispo, a mile of subterranean conduit. A Roman aqueduct exists in the street de la Cuna.

From 712 the city was occupied by the Arabs. The great mosque was built 1163-78, or 1171, or 1195-6 for the ameer Jacob abu Juzuf Almanzur. On Nov. 23, 1248 the city was taken by Ferdinand III of Leon and Castile; and is now the see of an archbishop. In 1386-90 additions were made to the mosque by A. Martinez, *maestro mayor*, who is considered to have designed 1401 for the chapter, the cathedral on its site, dedicated to the Virgin Mary. The original plans were removed to Madrid and destroyed 1734 in the fire at the palace. Martinez was followed 1421 by P. Garcia; 1462-72 J. Norman, *mm.*, when the work was half completed; P. de Toledo, *aparejador*, J. de Hocés, and Franc. Rodriguez were appointed *mm.* in order to expedite the work; 1496-1502 Jimon or Ximon, *mm.*; succeeded 1503 by A. Rodriguez; and G. de Rojas 1507 finished the *cimborio* or cupola. The cathedral became ruinous, the *cimborio* having fallen about 1511; P. de Morales *mm.* in 1512 and Juan de Herrera *apar.* 1512-24; after a report by H. de Egas, P. Lopez, J. de Alava, and J. de Badajoz, it was restored without a dome by J. Gil de Montañon *mm.* (not by the supposed il maestro Filippo), was surveyed by J. de Badajoz and J. de Alava, and completed 1517-9. Miguel and Antonio Florentin are said 1547 to have decorated it. In 1530 the edifice was reported on by D. de Rianno, Seb. Rodriguez de Escobar, D. Rodriguez, and F. de Limpías.

For the *capilla real* a design was made Nov. 1519 but not carried out, by J. de Alava and H. de Egas; that by M. de Gainza was carried out from 1541 after approval by a commission of four architects (A. de Covarrubias); it is 81 ft. by 59 ft. by 130 ft. high; continued after his death in 1555 by F. Ruiz II, and completed 1575 by J. de Maeda. In it is the tomb to king Ferdinand III (died 30 May 1252).

1522 Ximon Perez (JIMON) submitted designs in competition for the sacristies; 1528-35 D. de Rianno, *mm.*, designed the *sacristia mayor*, surveyed 1535 by Rod. Gil de Montanon; was succeeded as *mm.* 16 April 1535 by M. de Gainza (*apar.* from 1530), who carried out Rianno's designs for the *sala capitular*, *sacristia mayor*, and *sacristia de los calices* in the three different styles; 1532 M. de Bonilla *apar.*, 1534 J. de Colona *apar.*; 1538 R. Gil de Montanon was *mm.*; and continued 1558 by F. Ruiz III *mm.*; succeeded by P. Diaz de Palacios, *mm.*, who being dismissed 19 Nov. 1574, it was completed 1575 by J. de Maeda. In 1557 eight architects reported on a settlement in the building; 1777 part was remodelled by L. Cintoria. The *sala capitular* appears to have been continued by A. de Ribera and D. M. de Oliva; 1582-4 by A. de Maeda or Maeda *mm.* (died about 1618-9), who finished it with the advice of J. de Minjares; it is considered one of the finest works in the kingdom. These works were continued 1587-1618 by M. de Zumarraga, *apar.*, and on his death 3 July 1651 by F. de Oviedo, *apar.*, at the chapel of the *sagrario*, where a crack occurring the lantern was not placed on the dome; 1660 it was reported on by G. de la Pena, F. Diaz, J. de Rueda, and L. de Barcelona; it was completed 1662 by L. F. de Iglesias by the figure of S. Thomas Aquinas as it is now. The dome was not damaged by the earthquake of 9 Oct. 1680, but in 1691 A. Moreno and A. de la Concepcion examined it in consequence of a few cracks appearing; these were filled up. 1824 S. Perez removed the great timber reredos in the sacristy. After the earthquake of 1 Nov. 1775, the building was reported upon by M. Fernandez, who lightened the cupola of its heavy external ornament and replaced the figure of Faith by a cross; and he drew (for the cardinal archbishop Delgado) the plans, etc., of the whole building, which were engraved by J. Ballester. The pavement of black and white marble was laid 1789-93. The edifice was being restored under S. Casanova, from 1883.

The cathedral is the largest in Spain and has five aisles, the centre one being 56 ft. wide and the side ones 40 ft., all from centres of columns. The interior length is 420 ft. Span long and 291 ft. wide (or 398 by 291; 414 by 271; or 415 by 298 FERGUSSON), and 134 ft. high (or 150 ft., or 145 ft. FERGUSSON), and 171 ft. to the dome. There are 26 chapels in the aisles. The stone is from the quarries at Xeres de la Fronteira. The high altar had a tabernacle 1596 and atriels by Francisco Alfaro. The silver *custodia* 12 ft. high, 1580-7 is either by J. de Arfe or 1668 by Juan de Segura. The painted glass dating from 1504 is the finest in Spain; it was commenced by Micer Christobal Aleman, and continued 1518 by Bernal a Fleming, 1525-57 by Arnao de Vergana and Arnao de Flandes; and by C. Bruxes and V. Menandro up to 1569. The famous catafalque of wood and canvas to king Philip II (died 13 Sept. 1598), and that of his sister queen Margarita (died 1586) were between the *coro* and *capilla mayor*; they were designed 1589 by J. de Oviedo, the then *mm.* MARIANO DE LA C. Y P., *Descr. del templo Cat.*, etc., 16mo, Sev., 1850. CAEN BERMUDEZ, *Descr. Artistica de la Cat. de S. Svo.*, 1804. Plan in FERGUSSON, *History*. View of interior of transept, in *BUILDER Journal*, 1883, xiv, 316.

The *sazimah* or tower, 250 ft. high, formed part of the mosque, built 1100, 1160, or completed 1196 by Jabir, Gever, or Heber; 1395 repaired; 1568-70 the belfry added by F. Ruiz II, making the tower 100 ft. higher; about 1574 continued by J. Diaz de Palacios; and 1604-64 the sixth story completed and the gilt bronze weathercock statue of Faith, 14 ft. high, placed on it, weighing nearly 4,000 lb. (prepared 1566 by B. Morel), hence the name "Giralda" applied to the tower. Of the archiepiscopal

palace, begun 1664 (?), the principal portal 1704 is by L. Fernandez de Iglesias.

Before the French invasion Seville had 140 churches, twenty-eight of which were parish churches. The following may be noticed.

- S. Lorenzo; retablo mayor 1612 by Juan Martinez.
 S. Clemente; fine roof; plateresque high altar by Montañez.
 S. Marcos, parish; tower, chief porch, etc., S. G. work; two plates.
 S. Pablo of the Preaching Friars; magnificent, *cir.* 1692-1708 by Miguel de Figueroa (history in LLAGUNO, iv, 85).
 S. Marina; two round windows in S. G. work.
 S. Pedro; retablo mayor 1612 by Juan Martinez; Moorish tower.
 S. Millan; and Omnium Sanctorum; a small round window in each is given in S. G. work.
 S. Juan de la Palma; a former mosque; in S. G. work.
 S. Esteban; was a mosque; S. G. work. S. Isidore.
 Sta. Maria la Blanca; a mosque before 1891; with Sta. Cruz, and S. Bartholomew, formed the ancient Jewish quarter.
 La Feria is Moorish
 S. Salvador collegiate; the church begun 1 Dec. 1674 by E. Garcia; arches fell 1679; surveyed 1682; continued by J. Granados; 1694 A. Escudero Fernandez then acting as *apar.* was one of twelve who examined the stability of the church; continued 1694 by F. Gomez Septier; 1702-11 by L. de Figueroa; and finished Feb. 1712 by D. Diaz. LLAGUNO, iv, 62, 67, 199, gives its history.
 Ch. de los Marcanes or S. Telmo; *cir.* 1690 by A. Rodriguez and A. Gonzalez. S. Vicente; founded 300.
 Jesuit church del Noviciado; 1568-79; continued 1709-31 by Mig. de Figueroa. The retablo mayor of the church of the house of the Jesuits by A. Matias; LLAGUNO, iv, 87. The University founded 1502 was placed in it 1767 and arranged by Herrera.
 Monte Sion; church and monastery of Dominican fathers; first stone 1559-1601.
 Minor clergy of Esperitu Santo; 1655 by S. de Ruesta.
 Church of the college of the Beas; ? 1680 by E. Lopez de Rojas, *mm.*

The buildings of the former forty monasteries, twenty-nine convents, and four founding hospitals, mostly exist.

La Merced, founded 1249 by Ferdinand III of Castile; in it is the provincial library and gallery of paintings collected from the former ecclesiastical buildings.

Señor San José; for 680 foundlings; founded 1548.

La Sangre for 300 patients, founded 1545 on a competition, by P. Machuca; D. Hernandez. In 1543 B. de Morales and F. Ruiz I were appointed to erect it; first stone laid 12 March 1546-55; 1556 J. Sanchez consulted on the works; 1555-58; and after 17 June 1558 by F. Ruiz II who with M. de Gainza, and M. de Valcarren reported upon it; and completed 1564-70. 19 July 1583-4 by A. de Maeda with his portal 1618. M. Perez, *mm.* 1587-97; 1590 five architects with Juan Minjares declared in favour of covering the church with a timber roof, but it is arched in stone. 1600-1 the retablo mayor by D. Lopez.

De la Caridad, founded xvii cent. by don Miguel Mañara; a good church.

De S. Hermengildo (Gothic), founded 1433 for the wounded.

The outside the chapel of that of S. George is decorated by mosaics after designs by Murillo.

S. Francisco; monastery of the fathers Terceros, for king Pedro, is of great extent; great staircase 1713 by fra M. Ramos.

Buenavista junta, monastery; 1603 principal cloister by J. de Herrera.

The casa de la contratacion, *la longa*, or the exchange, about 200 ft. square, was carried out 1585-98 by J. de Minjares from the designs of J. de Herrera; over it are the archives of the Indies in the arcaded galleries designed *cir.* 1780 by L. Cintoria, who 1786 published a vindication of his alterations. The *casas capitulares*, is incomplete. The *real* (naval) *collegio* of S. Telmo, first stone by A. Rodriguez; designed 10 March 1682-1724, halls, dwellings, church, and west tower, by F. Munoz; 1725-34 decorated, etc., by L. de Figueroa and his son; works resumed 1775 by A. M. de Figueroa, who also erected the seminario de nobles, finished 1796; LLAGUNO, iv, 74. The cannon foundry with a large portico, founded 1565. The *fabrica de tabaco*, 662 ft. by 524 ft. with twenty-eight internal courts and surrounded by a moat, commenced by Juan Wandemder of Flanders, continued from 1725 by V. Acero, J. V. Catalan, and N. Vengoechea; about 1760 L. Cintoria was *aparejador*; LLAGUNO, iv, 108. *Atarazanos de Azogues* or quicksilver warehouse. *Casa de moneda* or mint; 1586 by J. de Herrera, now transferred to Madrid. *Aduana* or custom house, 1586 by J. de Herrera, completed

1792. *Audiencia* or high court of Seville. *Casa del ayuntamiento*, 1527, 1545 works directed by J. Sanchez, opened 1556, completed 1564; it is dated 1559; WARING AND MACQUOID, *Arch. Art.*, fol., London, 1850, pl. 53; three doorways and balconies, with details, 2 plates, in S. G. work. Good prison for 680 persons, in the suppressed convent of del Pablo about 1848. The *presidio Peninsular* 1838 for 1,200 galley slaves in suppressed convent of Augustines outside the city. *Matadero* or shambles. The market is large and well arranged in streets, etc. *Alhondiga* or public granary, Moorish, square court, very fine. *Plaza de toros* or bull ring for 12,000-14,000 spectators; LAKE PRICE, *Tauromachia*, fol., London, 26 pl. 1. 14. 15. 50. 66. 96.

ORTIZ Y ZUNIGA, *Anales de la Ciudad*, 1246-1671, 5 vols., 4to., Mad., 1795, 2nd edit. MORGADO, *Hist. de Sev.*, fol., Sev., 1587. CARO, *Antigüedades, etc.*, fol., 1634. STANDISH, *Sev. and its Vicinity*, 8vo., London, 1840, a very good guide. L. MEUNIER, *Diverses Vues, etc.*, obl. 4to., cir. 1650, 5 plates. ESPINOSA, *Hist. Antiq. y Grandezas de la ciudad de S.*, 4to., Sev., 1627-30. QUINTANA, *Sevilla*, 8vo., Sev., 1637. *Descripción Artística de S.*, 1804. AMADOR DE LOS RÍOS, *Sev. Pintoresca*, 4to., Sev., 1844. STREET, *Gothic Arch. in Spain*, does not mention the city. TAYLOR, *Voyage en Espagne*, 4to., Paris, 1826; 1832, gives views of the cathedral, giralda, alcazar, S. Telmo, old columns in the Alameda, church in place del Duc. ESCOSURA and VILLEAMIL, *Espagne artistique*, fol., Paris, 1842-59, ii, gives the Torre del oro, ailes of cathedral, giralda, gateway and arches of Carmona, and church of La Feria. SPANISH ARCHITECTURE. ITALICA.

SEVIUS LUPUS; see SEVIUS.

66.

SEWAGE. SULLIAGE. The excrementitious matter of all sorts passing from a building by drains and sewers to some prepared outlet. It has been calculated by Mr. Lawes that the sewage of London contains 94 per cent. of water, diluted by the water companies at the rate of 20 gallons per head and a rainfall of 24 to 25 gallons more, whereby a ton of sewage would contain 9 oz. of matter; with the addition of soapsuds and dishwashings perhaps doubled; SOCIETY OF ARTS *Journal*, 1855, p. 308. There are advocates of the earth-closet system; and the taking away periodically of the sewage in closed receptacles, as at Heidelberg; and still to a great extent at Paris. This sewage is of far greater quality than that of London. C. N. BAZALGETTE, *The Sewage Question*, read at Inst. of Civil Engineers 1876-77, submitted the following conclusions: 1. That no chemical process could *per se* efficiently deal with sewage. 2. That where land could be acquired at a reasonable rate irrigation was the best system for the disposal of sewage. 3. That the dry-earth system should be regarded as only supplementary to a water-carriage system. 4. That the Liernur system should never be imported into an English town. 5. That towns situated upon the seaboard, or within the tidal range of rivers, should avail themselves of this means of outfall.

RAWLINSON, *Drainage of Towns*, 8vo., 1854; and at INST. OF CIVIL ENGINEERS, *Proceedings*, xii. *Report*, 20 July 1863, on the nine tenders for utilizing the sewage of London, submitted to the Met. Board of Works. *Report of the Select Committee* on utilizing the sewage of the metropolis, 1864, gives in S. H. Gael's evidence, the various acts of Parliament passed for the regulation of the sewers of the metropolis, and other matters relating thereto. KREPP, *The Sewage Question, being a general review of all systems and methods hitherto employed in various Countries for Draining Cities and Utilizing Sewage*; also a description of captain Liernur's system, 8vo., 1867. HOFMAN and FRANKLAND, *Report to the Met. Board of Works*, 12 Aug. 1859. WICKSTEAD, *Report on Sewage Munure*, 1854. ISAACS, *A General Treatise*, 1859. ROBINSON, *Sewage Disposal*, new edit., 8vo., 1885. J. BAILEY DENTON, *Sanitary Works and Sewage Utilization*, 8vo., 1869; and *Sewage Disposal*, 1880; 1885; *Sewage Question*, 1871. BURKE, *Handbook of Sewage Utilization*, 2nd edit., 8vo., 1873, with Appendix, including the law relating thereto. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, also gives 1870-71 JACOB, *Treatment of Town Sewage*, xxxii. THE SURVEYORS' ARCH. PUB. SOC.

INSTITUTION, *Transactions*, gives 1868-9 HOPE, *Distrib. and Agric. Use of Town Sewage*; 1870-1 MORGAN, *Utilization of Sewage, Lodge Farm, Barking*; 1872-3 HOPE *On Sewage Farming*; 1877-8 BIRCH, *Use of Sewage by Farms*; 1878-9 STURGE, *Disposal of Sewage in Paris, and Farms of Gennevilliers*; 1884-5 ROBINSON, *Some Recent Phases of the Sewage Question*. THE SANITARY RECORD *Journal*, 1883, of the SANITARY INSTITUTE OF GREAT BRITAIN. BOULNOIS, *Municipal and Sanitary Engineers' Handbook*, 8vo., 1885. SANITATION.

SEWAGE FARM. A place adapted for disposing of the sewage of the town or series of villages, by passing it over lands by irrigation. THE INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, gives Barking, xlviii; Craigentenny meadows near Edinburgh, vii; xx; Croydon, xx; Doncaster, xlix; near Glasgow, vii; Paris, xxxix; liii; Wrexham and Crewe, xlix; "A B C" process by SHELFORD, xlv; xlviii; (*Sewage filtration*, xlviii; at Merthyr Tydvil, xliii; at Kendal, xlviii). Cheltenham and Bishops Stortford are well managed; and the farm at Leamington, perhaps the best in England, is described in *Journal* of the ROY. AGRIC. SOCIETY. SEWERAGE.

SEWARD (HENRY HAKE), F.R.I.B.A.; born about 1778, became a pupil May 1794 of Sir John Soane, R.A., remaining in his office until July 1808, shortly before which he was elected a district surveyor. In 1810 he entered into partnership with Geo. Byfield; in consequence of whose ill-health Seward was appointed joint surveyor with him of the estates of the dean and chapter of Westminster, and held that office even after his government appointments in 1823. In 1810 he was appointed clerk of the works to the royal hospital at Greenwich; and succeeded John Yenn as surveyor on his retirement, during which periods he designed the west façade of the north-west wing of the hospital; and on the division of the parish and rectory of Simonburn in Northumberland, he designed for the commissioners five district churches with their parsonage houses. In 1816-20 he designed the county jail at Bristol; and the baths and reading-rooms at Clifton hot wells. On the retirement Dec. 1822 of Robert Browne, Seward was appointed assistant surveyor general and cashier to his majesty's Board of Works; he then 1823 resigned the surveyorship to Greenwich hospital (succeeded by J. Kay), and relinquished general practice. On the amalgamation 1832 of this board with the department of the woods and forests, he was appointed surveyor of works and buildings, which office he resigned in 1844 from declining health. He died 19 January 1848 after much suffering, aged 70. ROYAL INST. OF BRIT. ARCHITECTS, *Report* for 1848, p. 15.

SEWER and SEWERAGE (said to be derived from Old Fr. *asscour*: or from *issue* or *issuer*, by B. Denton, in 1869: or from *seavoir*). CLOACA of the Romans formed by Tarquin; STRABO, lv, p. 360; PLINY, *H. N.*, xxxvi, 24; CASSIODORUS, *Var.*, iii, 30-31; vi, 6; PROCOPIUS, *Goth.*, i, 19; NARDINI, *Roma Antica*, 514-52. DIODORUS, xi, 25, makes special mention of the sewers of Agrigentum, constructed about B.C. 480 by Phaeax; others at Fiesole and Arpino.

"Sewer in architecture; a conduit, conduct, sink, or conveyance for the sulliage and filth of a house,—in these ignoble conveyances art should imitate nature, and conceal them from sight, where there wants a running water, into the most remote, lowest, and thickest part of the foundation, with secret vents passing up through the walls (like a tunnel), to the wide air aloft; which all Italian artisans commend for the discharge of noisome vapours, though elsewhere, as I imagine, little practised"; NEVE, *Builder's Diet*, 8vo., London, 1736. This term "Sewer" originally contemplated only the "waterways" that were navigable; the act of James I extended the jurisdiction of the commissioners of Sewers to the "gutters, streams, and water courses" within a limit of two miles from the city. In former times, wells or cesspools were pumped empty into the open channel in the middle of the street, flowed down it, and found its way into natural water-courses. Sewers later were

classified under three heads—main sewers, from 3 ft. wide and upwards, and 4 ft. 6 in. high and upwards; common sewers (belonging to the streets), about 2 ft. and 2 ft. 6 in. wide; and the small outlets or house drains about 6, 9, and 12 in. diam. The water-closet system (without cesspools) was introduced about 1847, and then the "sewage" was flushed into the sewers.

Sewers are now more generally formed egg-shaped (BUILDER *Journal*, 1848, vi, 20) and executed in 9 in. brickwork, springing from a stoneware invert; also of glazed stoneware and well jointed; these became a large article of manufacture in consequence of the sanitary agitation of 1848. In 1862 salt glazed socketed pipes were made 4 ft. 6 in. diam.; each pipe weighing 25 cwt.; Egg-shaped pipe 36 in. by 24 in. for a main drain; Circular pipe 30 in. diam. for water culverts; the sockets are all uniform, being made by machinery at the same time as the pipe itself; BUILDER *Journal*, 1862, xx, 472. The straighter the sewer or drain is laid the better, curves should be very carefully looked to, to prevent stoppage; and they must be laid to a good current to carry off the soil; the head sewers should have a flushing apparatus to cleanse them at periods. A sewer is liable to blow up if surcharged with water; and a brick sewer to fall in from any shifting of the ground in which it is built. EARTHENWARE. PIPE DRAINAGE. STONEWARE. TUBULAR.

DEMPSY, *Drainage of Buildings and Towns* (Weale), 1849. *Drainage of Districts and Lands* (Weale). Sewers of Hamburg, ALLGEMEINE BAUZEITUNG, 1846, pl. 72-6. ISAAC SHONE, *Pneumatic Sewerage System, etc.*, 8vo., 1880. GERHARD, *Diagram for Sewer Calculations*, 8vo. SPON, in *Diet. of Engineering*, suppl. A. SMITH, *Pneumatic Drainage*, 8vo. J. W. ADAMS, *Sewers and Drains for Populous Districts, with Rules and Formula*, 8vo. *Facts and Fallacies of the Sewage Systems of London and other large Towns; plans, etc.*, 8vo. HEALTH EXHIBITION LITERATURE, 1884; as ROGERS FIELD, *Disposal of Sewage of Country Houses*, vol. i. GENERAL BOARD OF HEALTH, *Minutes of Information collected with reference to Works for the removal of Soil Water or Drainage of dwelling houses and public edifices; and for the Sewerage and Draining of the Sites of Towns*, 1852, gives also sections of the old and new forms of Sewers. RAWLINSON, *Suggestions as to the preparation of District Maps and Plans for Main Sewerage, Drainage, etc.*, in connection with the Public Health Act, 1875; revised edition 1878. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, gives GRANTHAM, *Commission of Sewers, Historical Notice*, xix; RENNIE, v; *Large Sewers versus Small*, xxiv; RAWLINSON, *Sections and Dimensions*, xxiv; *Principles for laying out, Dimensions, etc.*, xxii. BAZALGETTE, *Dimensions, Sections, and Falls of Sewers in London*, xxiv; GRANT, xxxii; *Pipe Sewers*, xi, 42, 69. BAILEY DENTON, *Sanitary Engineering*, 1877. BALDWIN LATHAM, *Sanitary Engineering, Sewerage*, 1873; and his *Lectures at Chatham* at the Royal Engineers (priv. publ.).

SEWER GAS. A misnomer for the "foul air" generated in close sewers, as stated by prof. Corfield, at the Royal Institute of British Architects, 29 Nov. 1880, *Proceedings*, p. 74. "The gases, however, are as a rule, of far less importance than the foetid organic matters"—"the air of sewers passing into houses aggravates most decidedly the severity of all the exanthemata—erysipelas, hospital gangrene, and puerperal fever; and it has probably an injurious effect on all diseases. Two special diseases have been supposed to arise from the air of sewers and fecal emanations, viz., diarrhoea and typhoid (enteric) fever"; PARKES, *Manual of Practical Hygiene*, 5th edit, by de Chaumont, 1878.

The ventilation of the sewer into the street, or where possible, up a shaft to the top of the adjoining houses; and of the drain to the top of the house before it enters the house; and also, from the further end, or head, of the drain, and of the soil pipes, to the top of the house, are the essentials of the present views of sanitary regulations. A *Report on the Ventilation of Sewers*, by G. B. NICHOLS, C.E., to the King's Norton Union rural sanitary authority, gave in a tabular form the various methods adopted in many of the cities and towns in England; it is

printed in LOCAL GOVERNMENT CHRONICLE; and other papers about Aug. 1881. A sewer weir and geometrical staircase designed by sir J. W. Bazalgette, is engraved in SANITARY ENGINEER *Journal* of Oct. 1, 1881.

SEXPARTITE VAULT. It occurs in Gothic architecture but is rare. SCOTT, *Lectures*, 8vo., 1879, ii, 196-8; 207. PETIT, *Boisgrove Priory*, 1861, p. 7.

SEXTANS. The sixth part of the *jugerum*; see ACTUS.

SEXTFOOTHER. A term applied to a stone at the quarry, in the Ely Sacrist Roll; not hitherto explained. 16.

SEXTON; see SACRISTAN; supposed derived through Seggerstone; BUILDER *Journal*, 1883, xlv, 707; 773. A house for the sexton is attached to the church of S. Florinus at Coblenz; WILLIS, *Arch. Notes*, 8vo., London, 1842, p. 179.

SEXTRY. The SACRISTY of a church. SECRETARIUM. At the abbey at Gloucester, a chamber where the under steward dwelt, with a garden attached to it, was called the sextry; BRITTON, *Gloucester Cath.*, Essay, p. 13. WILLIS, *Sextry Barn at Ely*, 4to., 1843. 19.

SEXTUS; see Sextus POMPEIUS Agasias.

SEYSSSEL ASPHALTE; see BITUMEN. A natural bituminous limestone so called from the town of Seyssel, near which are the mines situated on both sides of the river Rhone where it separates France from Savoy. This mineral rockstone is a natural production, and can only be obtained from Seyssel Pyremont, Seyssel Perette, and Seyssel Frangy. Farrell's company (the Pyrimont Seyssel asphalte, Claridge's patent, 1838), imports the produce of the first, while Armani and Co. import that of the second and are proprietors of half the production of the third; BUILDER *Journal*, 1860, xviii, 355.

SEYT HOUSE. A dwelling house of five rooms, and also a barn of five rooms. SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 447.

SEYVORNS. In 1532 at Durham, timber was sawn into these stuffs among others.

SFERA (LANGILOTTO), of Orvieto, was employed about 1501 on the duomo in that city. 67.

SFERRANDINO (ANTONIO), 1542 with Gio. Carrara (? Gio. Maffei of Carrara) designed the spedale della Pietà, at Messina; completed 1605.

SGIGATA or STORA, in Algiers; formerly RUSCADA.

SGRAFFITO. The Italian word for SCRATCH WORK; HATCHING; black and white work; and chiar-oscuro of the writers of XVII and XVIII cent. A French author (5, in 1770) describes it as a sort of black and white fresco, which is called *manière égratignée*. VASARI, *Vite*, 8vo., Fir., *Introd. Pittura*, i, 169, describes the process; and in *Vives*, edit. 1851, iii, 348-9, states that it was the invention of Andrea Feltrini called di Cosimo, of Florence, who covered the fronts with an intonaco of black plaster, which while in its fresh state he covered with a white plaster, on to which he transferred his cartoons, and then hatched the outline with a graving iron so as to show the black plaster; he then went over the whole work with a black or darkly tinted water colour in a very fluent state, as stated in his (Vasari's) theoretic remarks under "Hatching". The first façade so done by Cosimo was that of the palazzo Gondi in the Borgo Ognissanti; then an elaborate one on Lung' Arno near the bridge of the Trinità; and another for A. and T. Sertini near the church of S. Michele was in a grander and more varied manner. VASARI, iv, p. 85, mentions that Perino del Vaga executed the front of the house of the marchesa di Massa near that of maestro Pasquino, in chiar-oscuro after the manner of Polidoro and Maturino. VASARI and BOSSI throw no light as to earlier works; but a case in the South Kensington museum is full of specimens of sgraffito pottery, Italian in origin and of XV century; possibly the application to house decoration in XV and XVI cents. followed. Polidoro da Caravaggio with Maturino, followed the system of "scratched work" at Rome before 1526; PILES, *Art of Painting*, 8vo., London (1754), 123, who 126 mentions Cosimo. D. Beccafumi and

G. da Udine produced works of this kind. Morto da Feltro in arabesques and grotesche was master of Cosimo.

Sgraffito is described (from Vasari) in NEVE, *Builder's Dict.*, 8vo., 1736, s. v. Painting, vi. SCIENCE AND ART DEPARTMENT, SOUTH KENSINGTON; *Twentieth Report (containing description of Sgraffito process)*, 8vo., Lond., 1873. A. S. COLE, *On Sgraffito Decoration*, read at Royal Inst. of British Architects, *Sessional Papers*, 10 March 1873, p. 127.

At Abou Simbel, is an inscription in sgraffito in the hieratic character left by a contemporary visitor; *temp.* of great temple of Ra; EDWARDS, at Society of Biblical Archaeology, 5 Dec. 1876. At Spoleto near the cathedral is a large palace covered with designs attributed to Julio Romano. LETAROUILLY, *Rome Moderne*, fol., Paris, 1849, pl. 110, gives of XVI cent. work a front in vicolo de' Matriciani. At Pisa is the front of the palazzo conventuale of the order of S. Stefano, by Forzori. 4. 5. 6. 25.

Modern works.—Inside the churches of All Saints, Winkleigh, and of Downe S. Mary, Devonshire; ASSOCIATED SOCIETIES, *Reports and Papers*, 1874, lxxviii; BUILDING NEWS JOURNAL, 1875, xxviii, 675. The schools for the choir boys of S. Paul's cathedral in Knightrider street, London, 1874, by F. C. Penrose; and the back of the South Kensington museum.

S'GRAVENHAGE. The Dutch name for THE HAGUE.

SHACKLE. The fastening of a door. "Locks and shackles plucked away," *cir.* 1600. ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1883, p. 45.

SHADE AND SHADOW. When light falls upon an opaque object in space, the portion of space which loses the light by the interposition of the object is called a shadow, but should be termed *shade*. If the light be merely a point and the object be a sphere, the shade is part of a cone: and if that cone be cut perpendicularly to its axes by a plane, its base will be defined as a circular *shadow* upon the plane: if the light be a mass, then the shadow will be the base of a cone comprising the light and the object, enlarged by a fainter shadow called the *penumbra*, of a width due to the relative distances of the light, object, and screen, and to the relative dimensions of the light and object. Such shadows are called *geometrical* shadows, and may be said to have no existence but in theory and in the conventional practice of draughtsmen; *physical* shadows, as they are really seen, are not so sharply defined on the plane, because part of the light passes into the shade, and conversely the shade influences the illuminated portion. When light passes the edge of a body, or when it passes through a small aperture, the luminous rays appear to become bent, and to penetrate into the shade: this is called *diffraction*. If a fine wire be the object, there will be a series of light and dark bands defined in the geometrical shadow; and outside the shadow will be similar bands: the interior fringes or bands are much narrower and more numerous than those external to the shadow; GANOT, *Elementary Treatise on Physics*, translated by Atkinson, 8vo., London, 1863, p. 347-8.

J. HAMILTON, *Stereography*, 2 vols., fol., 1739-49. DUPAIN DE MONTESSON, *Science des Ombres*, 1760. DE LA GARDETTE, *Elem. des Ombres*, 1786. NICHOLSON, *Principles of Arch.*, 1795-8; 1836. NOBLE, *Practical Persp. and Shadows*, 4to., 1805. L'EVEILLÉ, *Etudes d'Ombres*, 4to., 1812. GWILT, *Sciography, etc.*, 8vo., 1824; 1833. NICHOLSON, *Dict. of Architecture*, 1819; 1852-4. BROWN, *Persp. Rules for Shadowing, etc.*, 4to., 1835. DAVIES, *Treatise on Shades and Shadows, Perspective, etc.*, 8vo., New York, 1835; 1855. MONGE, *Géométrie—Ombres, etc.*, 6th edit., by BRISSON, 4to., 1838; 1847. BERTI, *Delle Ombre e del Chiar-oscuro*, 4to., 1841. RIBBANS, *Perspective and Shadows*, 8vo., 1843. HEATHER, *Theory of Shadows*, 1851. WARREN, *Shades and Shadows*, 8vo., 1867. PUCKETT, *S., or Radial Projection of Shadows*, 8vo., London, 1868; 3rd edit., 1877. 1.

JAMES, *Breadth of Light and Shadow in Architecture*, BUILDER JOURNAL, 1866, xxiv, 342, 363. DAVIES, *Architectural Shadows*, *idem*, 1846, iv, 378, 414. SCIOGRAPHIA. The "art of shadows" refers to sun-dials.

SHAFFIS; SHEIFFES. A certain measure of glass. 1515-6, iiij sheiffes de calabe, di m. 1476-7, for 20 sheifs of new glass 13s. 4d.; RAINE, *Auckland Castle*, 54; 1508, x shaffe Reuysh glase, etc.; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durham, 1859, p. 96; 353. 1482-3, for 9 shaffis vitri emptys apud Novum Castrum vis. viij*d.* 1532, for 8 shayff brynmys glasse, 4s. 8*d.*; SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 360; 447.

SHAFT. The body of a column, (Fr. *ftt* or *fust*, Gr. *scapus*) extending from the base to the capital; also called FUST, TRUNK, and BODY. FRUSTUM. APOTHESES, or upper scape; and APOPHYGIS or *apophysis*, or lower scape. It diminishes as it rises, and is generally executed in all good examples with a slight curve or ENTASIS. In the works of the period of Inigo Jones, the lower third is made upright and then carried up straight to the necking. The proportions of the shaft vary considerably in the five orders; they are to be found in most treatises on architecture. MONOLITH. 1.

SHAFT or vaulting shaft, in Gothic architecture, which rises from the floor to the centre of the roof.

SHAFT. The term applied to the slender mass of stone supporting vaulting; as at the *parloir* of the abbey of S. Germain des Prés, at Paris, where a single shaft of 3 in. Fr. diam. sustained the vault 33 Fr. ft. long and 29 ft. wide; TURPIN DE CRISSE, *etc.*, *Souvenirs de Paris*, fol., Paris, 1836, p. 10. Another in the transept at Fountains abbey, Yorkshire. A slender pier or pillar surrounded by shafts attached by bands, as to the central pillar in the chapter-houses at Worcester, Salisbury, Wells, and Lincoln. (PILLAR. CLUSTERED.) WILLIS, *Chichester Cath.*, 4to., 1861, p. 22; who in *Arch. of the Middle Ages*, 8vo., Camb., 1835, p. 34, pl. iv, considers "shafts may be comprised under Vaulting, Bearing, Sub-, Face, Edge, and Nook, shafts", all which he describes. The French terms for the various forms of similar shafts are given in DALY, *Revue Générale*, 1844, p. 293-4; and in some *Dictionnaires*, etc. Diminution of a shaft is noticed in VIOLET-LE-DUC, *Dict.*, s. v. Colonnnette, p. 500. "Verge, the shaft of a pillar"; ECCLESIOLOGIST JOURNAL, 1846, v, 169.

SHAFT as a monial; STREET, *Brick, etc., Architecture*, 8vo., London, 1855, *passim* 261, who also notices that the shaft in Italian Gothic diminishes.

SHAFT. The term used 1561 for a spire, "broche or shaft", and "bowl of the shaft"; ARCHÆOLOGIA, x, 75.

SHAFT of a chimney; see NECK. The tunnel, or flue. That portion which is carried up above the roof and usually finished with chimney-pots. *Illustrations*, s. v. Chimney top.

SHAFT of a factory chimney; see CHIMNEY STALK; and STALK.

SHAFT or collection of flues or chimneys. *Illustrations*, pl. 44, gives fig. 13 containing five, and fig. 12 having twenty-five flues, both at Chambord. One fire and one shaft to a house in the Isle of Wight; BUILDER JOURNAL, 1860, xviii, 330. CHIMNEY SHAFT. FIREPLACE.

SHAFT for dust, to convey it from each floor into the basement for removal. FLUE (p. 58). SHOOT.

SHAFT (Lat. *spiramen* or vent-hole). A tube for ventilating an underground passage or tunnel; SIMMS, *Tunnelling*, 1842, p. 41, 59, 67. BRES, *Glossary*, 1853, s. v. AQUEDUCT.

Spiramen to tombs; DENNIS, *Etruria*, 8vo., London, 1848, i, 123, 130, 361.

SHAFT of a king-post. The prismatic part between the joggles; NICHOLSON, *Dict. of Arch.*

SHAFTED IMPOST; see IMPOST. 19.

SHAFT RING; see BANDED COLUMN; ANNULATED COLUMN, to the examples there quoted, Salisbury and Worcester cathedrals may be added. A peculiar banded or filleted shaft is shown in DEANE, *Kilkenny*, in ROY. INST. OF BRITISH ARCHITECTS, *Sessional Papers*, 1865-66, p. 80; and 86 are mentioned those at Walsoken church, near Wisbeach, older than Kilkenny; and others in England; and in west front of Margam abbey, Glamorganshire, and the crozier arch at Strata Florida abbey, mid-Wales.

SHAHJEHANABAD or New Delhi; see DELHI.

SHAKE or SHAKEN STUFF. In timber; stuff that is cracked either with the heat of the sun, or the drought of the wind. "If the sun shine fiercely upon the boards, it will dry them so fast that they will tear or shake, which is in vulgar English split or crack"; MOXON, *Mechanick Exercises*, 4to., London, 1694, p. 151, 169. This was endeavoured to be obviated in the last century, when thick columns of wood were used, by boring out a hole of 1½ in. diameter or so, through the whole length in the centre. CLEFT. RYST. 1. 4. 14. 23.

SHAKING TOWER; see TOWER.

SHALE or Plate. Any argillaceous deposit, naturally divided into laminae parallel to the plane of deposition. These are sandy, calcareous, purely argillaceous, and carbonaceous, shales.

SHAM. An imitation; one thing like another. A work not what it is meant to represent. MASK; WALL VEIL; GRAINING or Combing; MARBLING; SCAGLIOLA; INCONSISTENCY; PLASTERING; PAPERHANGING. The oldest example of a sham is perhaps at Sakkarah, where the upper part of each arch of the excavations is plastered and lined to imitate stone. In the Xanthian Ionic Heroum, the bead and reel between the ranges of coffers was shaded so as to give it the effect of a carved ornament. In many of the Greek temples, especially of Sicily, the columns being built of a coarse stone, were finely plastered and painted more or less.

The outside plaster and whitewash at S. Alban's abbey church are described in BUCKLER; and in SCOTT, *Lectures*, 1879, ii, 98. The inside of many buildings were finely plastered, and decorated in painted ornament, as the crypt of S. John's church, Smithfield. In later times stone vaulting was imitated in timber, as at the chapel at Windsor 1243, "to be made to appear like stone work with good ceiling and painting." Vaulting of nave and choir of York cathedral; choir of Winchester; choir and lady chapel, or entire east limb, at S. Alban's; lantern at Ely; lantern at Peterborough; chapel of S. Mary's college at Winchester; choir at Selby abbey; tomb of bishop Boothe 1466 at Exeter; Warrington church, Northamptonshire; cloisters at Lincoln and Gloucester; in towers at Exeter; nave of Boston church; and common in work half a century old.

At Milan cathedral the capitals of the pillars in the nave and its vaulting are painted as carving and tracery. In the lantern roof at Ely, the shape of the quatrefoils and tracery were coarsely painted, to look as if they were pierced. In prior Crawden's chapel at Ely, a row of quatrefoils was painted round the pedestal of a niche and shaded. The corbel heads in the aisles in the Temple church, London, had glass beads for eyes. At S. Stephen's church, Carlby, the piscina of eight foils was painted to imitate marble; Early English period.

Gables not answering to the form of the roof behind, occur at the fine east end of Lincoln cathedral; east end of transepts of S. Fermo Maggiore, at Verona; Monza cathedral. False west façades occur at Salisbury; Como; S. Antonio at Padua; S. Francesco, Pavia; the Frari at Venice; Cremona and its two transepts; Orvieto; S. Laurence at Le Puy; Lincoln cathedral, where the lower part is built against the older one. Most popular in Italy and Germany wherever brick was most used; the Italian basilican churches were at first ornamented so as to hide the mechanical construction and give little or no clue to interior arrangements.

The windous lighting the waste spaces above the vaulting at Lincoln cathedral; and at Westminster abbey.

Gateway, false cannon, sham gurgoyles, etc., at Linlithgow palace. Imitation sentries on parapets, as at Alnwick castle and elsewhere.

The upper order, as a screen, to the outside of S. Paul's cathedral, London.

PURDIE, *On Imitation in Decoration*, read at Arch. Inst. of Scotland; BUILDER *Journal*, 1853, xi, 27-8; GARBETT, *On Shams*, *idem*, p. 50-3. *Materials of Groined Ceilings*, *ECCELOGIST Journal*, 1849, ix, 105.

SHAMBLES. The stalls on which butchers exposed their meat for sale in a market-place. Also a flesh market (*Sp. mataderos*). Also a bench or stool. 19.

SHAM DOOR. A panel of framework made to look like a door but it does not open; it is necessary where symmetry is required. JIB DOOR.

SHANAHAN (MICHAEL), published *Stone and Timber Bridges of modern Construction* in France, Switzerland, Italy, and Savoy, 33 pl., no text, fol., engraved and perhaps published at Vicenza, 1770.

SHANAHAN (HENRY), "the son of a very respectable architect at Cork"; SOCIETY OF ARTS, *ETC.*, *Transactions*, xxx, 109; sending 1812 a collection of marbles from the county of Cork.

SHANK. The term used 1646 for the upright part of a wayside cross; ASSOCIATED SOCIETIES, *Reports and Papers*, 1866, p. 270. The tunnel of a chimney. The space between the channels of the triglyph in the frieze of the Doric order; sometimes called "legs of the triglyph": *Lat. femur*. NICHOLSON, *Arch. Diet.* 1. 4. 19.

SHANKILL QUARRIES in co. Tipperary and Kilkenny supply a large quantity of stone for flagging; WILKINSON, *Geology, etc.*, 8vo., London, 1845, p. 208 and No. 65 in App.

SHAPING MACHINE. A machine for giving irregular forms. MOLESWORTH, *On the Conversion of Wood by Machinery*, read at INST. OF CIVIL ENGINEERS, 1857, xvii, 30.

SHAPOUR, Shapur, and Chapour. About ten miles from Kazeroum or Kauzerum, in Farsistan at the head of the Persian gulf, which is of considerable importance on account of the monument with three foreparts of kneeling bulls, as at Persepolis, over a semicircular but not truly arched opening, and a segmental relieving arch: as well as for the ornamental basin to the source of the river of the same name; these are given by FLANDIN, *Perse Ancienne*, fol., Paris, 1844, pl. 46-7; *Relation* ii, 248-80. There are also the bas-reliefs of Sapor, A.D. 240-73; and the rock-cut inscription of Valerian, captive; MYERS, *Ruins of Lost Empires*, 8vo., 1875, p. 288. Ox.

SHARD or SHERD. A broken piece of any brittle substance, as of pottery. GALLEY.

SHARK'S TOOTH; so called by RICKMAN, is now the dog's TOOTH ORNAMENT.

SHARP (JOHN), of York, designed in that city the deanery and the residentiary prebend's houses.

SHARP (RICHARD HEY), of York, a pupil of P. Atkinson, travelled 1816-9 through France to Pisa, Rome, Naples, and Athens (WOODS, *Letters*, 4to., 1822, i, 137; ii, 211, 330). On his return he entered into partnership with his master until 1828, when he practised on his own account. Horbury school, near Wakefield, Yorkshire, is given in CIVIL ENGINEER, *ETC.*, *Journal*, 1845, viii, 307. He died about 1853.

SHARP (SAMUEL), a younger brother of RICHARD was clerk in the office of P. Atkinson; obtained 1838 the Soane medal of the Institute of British Architects for a restoration of S. Mary's abbey at York; and 1839 another with a gold rim for a restoration of Sheriff Hutton castle, Yorks. He resided at Leeds; left the profession about 1846 and died about 1860. His son, an engineer, is (1885) abroad.

SHARPE (EDMUND), M.A.; F.R.I.B.A., and gold medallist 1875; born 31 Oct. 1809 at Knutsford, elected 1832 travelling bachelor of arts for the Cambridge university, spent three years in France and Germany; received instruction in architecture from T. Rickman, and 1836 settled at Lancaster; 1845 took E. G. Paley into partnership; retired 1851, after having designed about forty churches chiefly in the north of England, among which are the terra-cotta churches of Lever bridge and 1845 of Platt; ILLUSTRATED LONDON NEWS, vi, 77; BUILDER *Journal*, iii, 371; BUILDING NEWS *Journal*, vii, 562; the churches of Witton near Blackburn, and Bamber bridge. In conjunction with Mr. Paley, Wigan parish church, Hornby castle, Capernwray hall and other mansions, etc.

He published *Architectural Parallels*, fol., 1845-7; and *Full-sized Mouldings*, 1848. *Decorated Windows*, 1849; *Decorated Window Tracery*, 1849. *Seven Periods of English Architecture*, 1851; 1871. *S. Mary's Church, New Shoreham*, 1861. *The Lincoln Excursion*, 1871. *Mouldings of the Six Periods of British Architecture*, 1871. *Ornamentation of the Transitional Period of British Architecture*, 1871. *Architecture of the Cistercians*, 1874. *Ornamentation of the Transitional Period in Central Germany*, 1877. *Priory Church of S. Mary at Tynemouth*. *Churches of the Nene Valley*, 1880, and many Papers read at Societies, pamphlets, and articles, in the *Journals*, all enumerated in *The Domesd Churches of Charente*, 4to., 1882, with a memoir. He died at Milan, 8 May 1877. *BUILDER Journal*, xxxv, 491, 521, 550, 562. *BUILDING NEWS Journal*, xxxii, 484. *BRITISH CRITIC MAGAZINE*, 1840, p. 488.

SHARP NAIL. So called in 1750; made with a sharp point, the shank flat, and very useful for ordinary purposes where soft wood is used. These nails weighed from 2½ lb. to 75 lb. per thousand. 4.

SHASH WINDOW. An old way of writing SASH.

SHAVING. The thin slip taken off a piece of wood by a plane or other sharp tool.

SHAW (HENRY), F.S.A., born July 4, 1800, in London, assisted John Britton in his publications, and himself published several fine ones on architecture and art 1829-58. He died June 12, 1873.

SHAW (JOHN), F.L.S., F.S.A., F.R.S., born 10 March 1776, at Bexley, Kent; apprenticed for seven years with G. Gwilt; commenced business 1798; 1816 elected architect and surveyor to Christ's hospital, Newgate street, London, where he designed 1820-2 the infirmary, the western side of the quadrangle, 1825-29 the hall, and 1832 the mathematical and grammar schools; the whole costing about £30,000; *PENNY MAGAZINE*, 1832, i, 213. Appointed architect to the trustees of Ramsgate harbour, he designed the clockhouse, the steps called "Jacob's ladder", and the obelisk to commemorate the visit of king George IV on his progress to Hanover. He also 1820 designed Ham hall, Staffordshire, for Watts Russell, esq.; Cresswell, Northumberland, for Cresswell Baker, esq.; 1830-3 the octagon church of S. Dunstan's-in-the-West, Fleet Street; **BRITTON AND PUGIN**, *Public Buildings*, Supp. by LEEDS, 1-7; window in *GENTLEMAN'S MAGAZINE*, 1835; 1814 extensive alterations to Beaudesert, for the marquis of Anglesey; 1819 the restoration of Newstead abbey, Staffordshire, for Colonel Wildman; made alterations to Chilham castle, Kent, for J. B. Wildman, esq.; designed Rooksnest, Surrey, for C. H. Turner, esq.; 1815 Blendon hall, Kent, for J. Smith, esq., M.P.; Lamorby, Kent, for ... Malcolm, Esq.; Dunham Massey, Cheshire, for the earl of Stamford; 1813 the main body (destroyed by fire 1795) of Clifden, Bucks, for countess of Orkney and viscount Kirkwall (the colonnades were by T. Archer, *cir.* 1710); and 1816 Heath house, Staffordshire, for J. Philips, esq. He was extensively employed in the valuations of property in London consequent on the great alterations: was architect to the Phoenix Fire Assurance company; and a member of the Architects' Society. He died suddenly 30 July 1832, at Ramsgate, and was buried at Bexley. He left six sons and two daughters.

SHAW (JOHN), son of the above, designed 1827 villas, Sudley place, Bognor, for earl of Arran; succeeded his father as architect to Christ's hospital, where 1832 he carried out the grammar schools, 1836 the entrance from Newgate Street, and 1868-9 the baths, etc. In 1834 he designed the Law Life Assurance office, Fleet Street; 1837-8 Holy Trinity church, Great New Street; 1843-4 the royal naval school and chapel, at New Cross, Deptford (*BUILDER Journal*, i, 218); 1849 S. Dunstan's parochial schools; 1853-5 London and Provincial Law Life Association, Fleet Street (*idem*, xiii, 474); and 1855-59 Wellington college, Sandhurst; the plan, etc., with specification are given in *DONALDSON, Specif.*, 8vo., London, 1859, p. 549-636 (*idem*, xiv, 86). He was very largely engaged on valuations,

ARCH. PUB. SOC.

and in compensation cases for the metropolitan improvements, railway purchases, etc. He died before 15 July 1870, and was buried in Kensal Green cemetery: no memoir has appeared.

SHAW (WILLIAM); see SCHAW (W.).

SHAW (JOHN), "surveyor of Chester castle", May 1668 was paid £207 9s. 5d. for some works. British museum, Addit. MS. 18,795, fol. 39.

SHAWK STONE. The quarries of that name are situated in Cumberland. All up the valley there is a very large quantity of stone covered with a great depth of *debris* which is stone of a coarser texture. The "shawk" stone proper is red in colour and a fairly good stone, very similar in quality and texture to red Corsehill, but it runs in very much smaller-sized blocks and in much thinner lifts. The station it is loaded at is Curthwaite, on the Maryport and Carlisle line. It was used at the Civil Service Stores, Haymarket.

SHEARING. The shaping of iron; the breaking or cutting short of metal. The kind of fracture which would occur in the use of shears if their edges were blunt; or when the punch of a punching machine makes a hole in a plate. **FAIRBAIRN** deduced the following laws: I, that the ultimate resistance to shearing in any bolt or rivet is proportional to the sectional area of the bar torn asunder; and II, that the ultimate resistance of any bar to a shearing strain is nearly the same as the ultimate resistance of the same bar to a direct longitudinal tensile strain. *Stone* generally gives way to a crushing load by shearing. **DETRUSION**. **AITCHISON**, *Iron as a Building Material*, read at the Royal Inst. of British Architects, Feb. 1864, gives tables of several materials; and states that the shearing strength of wrought iron is better known than its power to resist crushing. A machine for shearing by hydraulic pressure is shown in *CIVIL ENGINEER, ETC., Journal*, 1846, ix, 385. **SAWYER**, *On Shearing, Punching, Rivetting, etc., Machinery*, read at INST. OF CIVIL ENGINEERS, *Proceedings*, Jan. 1858. In 1863 a pair of shears weighing 24 tons was made at Birmingham having a power of pressure of 1,000 tons and able to shear or snip to pieces a cold bar of iron 6 in. square; *BUILDER Journal*, 1863, xxi, 814.

In timber, the breaking away of the piece of a tie-beam between the end of it and the notch against which the principal rafter abuts; the rule of resistance is given in **HURST**, *Arch. Surveyor's Handbook*, 1865, p. 32. The shearing strength of Portland cement is given in **FALJA**, *Cement*, 1881, p. 24, 83-6.

SHEAR LEGS AND SHEARS; see **SHEER LEGS**.

SHEARS. "The modillions represent the ends of the shears; and the dentels the end of the rafters"; in **MOXON**, *Vitruvius Abridg'd*, 8vo., London, 1703, 5th edit., p. 2. This perhaps can be explained that in some publications on timber construction of this date, the spreading or tilting fillet to the tiling forms the modillion, and the dentils occur at the rafters or tie-beams.

SHEAR STEEL. Bars of blister steel are broken into lengths, faggoted, and rolled out a welding heat; the process is repeated until a near approach to uniformity of composition and texture has been obtained. This quality of steel is used for tools and cutting implements. 1.

SHEATHING. A covering applied to another material to preserve it; more specially applied in ship building. *A History of Wood and Lead Sheathing*, by J. J. WILKINSON, was read at Institution of Civil Engineers, 23 March 1841; in *CIVIL ENGINEER, ETC., Journal*, iv, 318; 357. Copper sheathing was first tried for the West Indies, but on account of its expense other substitutes have been proposed; *SCOTS MAGAZINE*, 1761, xliii, 698. **COPPER**. Muntz's metal of copper, zinc, and lead. **Wetterstedt's metal**. **Mushat's alloy**. Iron galvanised or coated with tin or zinc. Brown paper coated with tar. **CORROSION**. **OXIDATION**. **SHEETING**. Supp. 14.

SHEATHING NAIL. A nail to fasten sheathing boards to ships. They were three times as long as the board was thick, if it be of a sufficient thickness, vary from 1½ to 3½ in. long; the head well clasped or died so as to leave the ship's side smooth. 4.

SHEBDEN HEAD QUARRIES; see HALIFAX STONE.

SHED (Fr. *baraque*; *hutte*; *angar*; Ger. *schoppen*; *scheur*). It has a roof, and differs from a HOVEL in not being open on all sides, three sides being generally closed. *Sheds for Farms*; *Builder Journal*, xii, 660; xv, 100. Bullock shed. Byre. CATTLE SHED; SHIPPON. Cart or WAGGON SHED. Implement shed. Gardener's shed. PALACIA or shed made of branches of trees and brushwood. LEAN-TO. PENT-HOUSE ROOF. SELDAM.

SHED ROOF (Late Lat. *Aponsa*). The same as a lean-to roof, though a wide shed has often a collar-beam roof. KRAFFT, *L'Art de la Charpente*, fol., 1805, pt. 2, pl. 26-33. A shed roof of cast iron was 1813 a novelty. J. Rennie put up one at the London docks, 1,300 ft. by 29 ft. 6 in. span, supported on cast-iron columns 7½ in. diam. at bottom and 5½ at top. Another 1817, 54 ft. clear span between the supports over the mahogany warehouse; SMILES, *Lives*, 8vo., 1874, p. 307. *Wrought Iron Roofs for Work Sheds, etc.*, in *BUILDING NEWS Journal*, 1867, xiv, pl. 828, 846.

SHEELING. In Jura, in the Hebrides, a summer hut constructed of branches of trees covered with sods, used by goat-herds; oblong or conic, low, having a small opening through which access is obtained by creeping, the door made of birch twigs. PENNANT, *Tour to the Hebrides*, 4to., Chester, 1774, ii, p. 216 and plate.

SHEEP COT, -COTE, -FOLD, and -PEN (Med. *bercaria*). It should be about 50 full pens in extent, allowing 10 ft. for a sheep and lamb, and 1 foot for a ewe; the front wall 4 ft. high to the eaves; no walls are needed. It should be open to the south, and near to the root stores. The stalls may be about 3 ft. 6 in. and 1 ft. 9 in. wide (1 ft. wide or 15 in. for a ram) the average size of sheep; or they may be kept in pairs; or in pens of iron hurdling. A trough for the roots placed a little above the ground. A weaning house is necessary. FARM.

SHEEPHOUSE QUARRY. A limestone, obtained at Drogheda, and used 1866 at the new Union Bank, College Green, Dublin, for the dressings.

SHEER LEGS, and SHEERS or SHEARS (Fr. *chèvre*; *cisailles*). Two poles lashed together for lifting heavy weights, with a pulley at the top and a capstan rope passing over it. The sheers in Sheerness dockyard before 1853 were of timber 127 ft. long and 3 ft. 1 in. average diameter. Wrought iron sheer legs, to sustain 70 tons, erected in the Victoria (London) docks, 1856, by R. Mallet, C.E.; in *ENGINEER Journal*, Oct. 31, 1856, p. 591-2. The iron shears in the Southampton dock were erected 1862; they were the largest in England, are worked by steam, and capable of lifting 100 tons. The machine for raising stones employed at the Assize courts, Liverpool, and Custom house, is described in *BUILDER Journal*, 1845, iii, 91. *Aide mémoire*, s.v. Derrick. PENNY MAGAZINE, 1841, p. 253. DERRICK; GIN; HOIST; CRANE. FORFEX. Supp. 14.

SHEET GLASS. Metal blown into a cylinder or "muff" and opened out into a sheet. It was introduced 1832 into England from Germany, and is less wavy on the inside than crown glass. Thick sheet glass, opened out and rubbed flat while in a kiln forms PATENT PLATE GLASS. CHANCE, *Sheet Glass*, CIVIL ENGINEER, ETC., *Journal*, 1847, x, 27; xi, 304. Sheet Glass blowing for the Exhibition of 1851 building described in *ILLUSTRATED LONDON NEWS*, 1850, xvii, 469-70. CHANCE, *Manufacture of Crown and Sheet Glass*, read at Society of Arts, 13 Feb. 1856; *BUILDER Journal*, 1856, xiv, 140, 185, 205. See *Price Books and Lists*. GLASS. "Crystal white sheet glass" imported from Florence is apt to sweat inside and so injure framed and glazed works of art. Some of this name is very green in colour. Bohemian sheet glass, plain and also coloured, *BUILDER Journal*, xiv, 206, was sent from Karlsbad and Langenhaus near Hayda; Exhibition of Industry, 1851, *Illust. Cat.*, 522 and 525. JURORS' REPORTS, 522. PRACTICAL MECHANIC AND ENGINEER'S MAGAZINE, 1845, iv, 218, 237, 264, 303; vol. ii, 2 Ser., 2.

Blown sheet glass. The date of its introduction into England

is unknown. The act of Parliament 1777 fixes the duty on German sheet glass made in Great Britain. There were five sorts of sheet glass at weight per square foot: No. 1 average 13 oz.; 2, 16 oz.; 3, 21 oz.; extra over 26 oz. Plate average never under 32 oz. Usual size 41 in. by 31 in.: DEACON, in *Transactions of LIVERPOOL ARCHITECTURAL SOCIETY*, ii, 75.

SHEETING or SHEET PILING. A row of timbers (PILE) driven firmly side by side into the earth. Piling of planks is called "pile planking" and is sometimes joggled together. Sheet piling (REVELMENT) is used for protecting foundation walls from the effects of water; also in the construction of coffer dams and sluices. It is usually supported and secured to guide piles and waling pieces, along the top, by iron bolts. Sheet piling is always employed to support walls and other works next rivers and canals, and good clay should be well punned in at the back of the piles. Cast iron sheet piling is shown in STRICKLAND, *Reports, etc.*, 8vo., London, 1841, pl. 26; and both in ROMBERG, *Zimmerwerkes baukunst*, 4to., Leip., 1846-50. CRESY, *Encyclopædia*. 1.

SHEET METAL. Metal cast into a thin flat surface, as boiler plate, tin plate, cast lead, copper. WARN, *Sheet Metal Worker's Instructor*, 8vo., London, 1869. KITTEDGE, *Compendium of Architectural Sheet Metal Work*, 1877.

SHEIK ABADDEH; see ANTINOË, in Egypt.

SHELF. A board fixed horizontally to receive books, ornaments, utensils, as in a cupboard, closet, bookcase, or other enclosure. A range of shelving in a kitchen or scullery is called a DRESSER. A dairy, larder, or wine cellar may have marble, stone, or slate shelves. In a safe or strong-room the shelf is usually of iron. A wood plank or a slab of marble, cut and usually moulded, forms an appendage to a chimney piece. 1.

SHELL. The shell of the oyster has been used for many purposes in building. TIGHE AND DAVIS, *Windsor Castle*, 8vo., Lond., 1858, state that at Eton college in 1441, oyster shells at 4d. per bushel, were used; "only ye upper shells of oysters, and used where ye stones did not exactly fit, to thrust in among the mortar, and to key up the work"; as were all the beds of the new church of Sherborne abbey; ROY. INST. OF BRITISH ARCHITECTS, *Sessional Papers*, 1876-77, p. 143. The base of the obelisk on the tower of the church of S. Vedast, Foster Lane, built 1697 by sir C. Wren, was found to have been laid upon a thick mortar joint, in which were imbedded two courses of flat oyster shells, these together with the mortar were found uninjured about 1835; DAVY, *Foundations*, 1839.

In CHINESE ARCHITECTURE (*Detached Essay*, p. 4), it is stated that the open part of the windows is often filled with very thin oyster shells, sufficiently transparent to admit the light. At Bombay, in lieu of glass, panes of oyster shells are used in the windows, "which as they are cut in squares and polished, look gracefully enough"; J. FORBES, *Oriental Memoirs*, 4to., London, 1813, quoting FRYER, *New Account of East India and Persia*, 1672-81, fol., London, 1698.

Cockle shells have been used for PUGGING. SOUND.

SHELL BIT. A tool used for boring. BIT. It resembles the auger that has no screw at the end, but simply an interior cylindrical concavity, with a cutting edge. "Taper shell bits" are used to enlarge holes in wood. 14.

SHELL HEAD TO A NICHE (Fr. *coquille*; It. *conchiglia*). The name given by Italians to the head of a niche probably from the shell ornament so often placed in them; ROSSI, *Studio d'Architettura civile*, fol., Flor., 1711, ii, 20. The shell of S. Iago ornaments the head of the apse of the church of S. Giacomo Maggiore, at Bologna. The lower part of the top of the vault to the semicircular exedra in the Street of the Tombs at Pompeii, is moulded in the form of a shell and painted white. 5.

SHELL LAC; see LAC.

SHELL LIME. Although unknown in England, it is much used in some parts of America. Oyster shell lime will stand both water and fire well, but its colour is very indifferent. Its property of enduring heat would render it useful for setting

ovens, furnaces, etc. (1838). An Elgin specification described that good lime mortar can be composed of slaked Scotch lime shells, clean sharp sand, and pure water; MORTAR (p. 124). At Madras, a cement is made from the lime produced from sea shells mixed with a river mud; also coral lime and a river mud, on the opposite side of India. "The spandrels to the cupolas of the ailes of the nave in S. Paul's cathedral are of sound brick invested with stucco of cockle-shell lime, which becomes as hard as Portland stone"; WREN, *Parentalia*, fol., 1750, p. 291. The shells used to be collected near Canvey island, Essex, for burning to lime.

SHELL SAND; see GRAVEL.

SHELTON (THEOPHILUS), designed in a Gothic style Long hall, near Shiffhall, Shropshire, for general Durant "who was his own architect", and who purchased the estate about 1762, as stated in NEALE, *Seats, etc.*, 4to., 1825, ii, 2nd Series.

SHELWICK AND THE CAPLER QUARRY, near Fawley, Hereford; supplied the sandstone used 1788-97 and 1841-5 in the repairs at Hereford cathedral.

SHEPAE. A Chinese memorial; a large stone slab, about 8 ft. high, 2 ft. wide, and 6 in. thick, covered with inscriptions, and always erected perpendicularly on the mystical figure of a tortoise of the same stone as the slab. *Detached Essay*, Chinese Architecture, p. 13.

SHEPHERD, Shephard and Sheppard (EDWARD), was 1704-8 owner of Shepherd's market and other buildings about Mayfair. He was employed 1712-20 with J. Gibbs and J. James at Canons, Middlesex, by the duke of Chandos (*Beauties of England, etc.*, 8vo., 1816, x, 635); and about 1720 said to have designed the offices, etc., to a house on the north side of Cavendish Square, for the duke, which were to be erected for £600 and cost £1,800; LANGLEY, *London Prices*, 8vo., 1750, p. xiii; they are also attributed to J. James. He designed the octagonal buildings at each end of lord Harrington's house, afterwards lord Camelford's, at Petersham; 1714 the Duke's theatre in Portugal Street for C. and J. Rich; 1732 the first Covent Garden theatre for J. Rich; and 1741 the theatre in Great Alie or Ayliff Street, Goodman's fields; WILKINSON, *Londinia Illustrata*, fol., London, 1819 25. He died 24 October 1745. CUNNINGHAM, *Handbook of London*, 8vo., 1850, p. 327. ACKERMANN, *Repository of Arts*, 8vo., London, 1817, iv, 81.

SHEPHERD (JOHN), was surveyor to the corporation of the London Assurance. E. Hoppus succeeded him 4 June 1729.

SHEPHERD (VINCENT), of Alnwick. He restored or rebuilt in the Gothic style the choir of the parish church; "a large proportion of his professional life was almost exclusively devoted to the duke of Northumberland." He died previous to May 1812, aged 62. GENTLEMAN'S MAG., 1812, lxxxii, 601.

SHEPPEY CEMENT; see ROMAN; CALCAREOUS; and PARKER'S CEMENT.

SHERBORNE or Shirburn. An episcopal see founded about 705, removed to Ramsbury, then to Wilton, 1075 to Old Sarum, and 1220 to Salisbury.

SHEREEFKHAN; see ASSYRIAN ARCHITECTURE: and KOUYUNJIK.

SHERIFFES of glass; see SHEFFES.

SHERINGHAM'S VENTILATOR. A ventilator for the admission of fresh air, fixed in an outside wall near the ceiling. It consists of an iron frame in which a fall-down flap is fitted on the inside, forcing the air coming in to pass towards and along the ceiling; it thus becomes warm before descending. It differs from the "Arnott ventilator" which is fixed in a flue to take off foul air from a room.

SHICKHARD (HEINRICH); see SCHICKHARD (H.).

SHIDE; see SHINGLE.

SHIELD. A framed work to protect the workmen from any thing dropping on them while at work. SIMMS, *Practical Tunneling*, 4to., London, 1844. INSTITUTION OF CIVIL ENGINEERS, ii, 80. TUNNEL. FAN to hoarding.

SHIELD for a coat of arms; see ESCUTCHEON. SCUTALE.

SHIFT. The term used where gangs of men are employed alternately, and are described as "double shifts", which is found more expensive than "single shifts", although occasionally resorted to during long days where great speed is necessary. Night work is also considerably more expensive than that performed during the usual working hours. "Shift" is also the time a miner works in one day.

SHILEA, in Japan. These are celebrated Buddhist temples, probably the largest and richest in the world. They contain the tombs of the Shoguns or members of the imperial family. Near them is the ancient capital, Kamakura, now a village, where is a bronze sitting statue of Buddha 44 ft. high. ARCHITECT Journal, 3 Jan. 1880. CONDER, *Notes on Japanese Arch.*, read at ROY. INST. OF BRIT. ARCHTS., *Sessional Papers*, 1877-8.

SHILF. Broken slate in small pieces, as used for mending roads in parts of Cornwall.

SHING-KING; see MONKDEN, in China.

SHINGLE; see GRAVEL; PEBBLE; PAVEMENT. ROOKE, *Action of Silt and Shingle*, in CIVIL ENGINEER, ETC., *Journal*, 1845, viii, 309. REID, *Prof. Papers* of the corps of Royal Engineers, ii. PALMER, *Movements of Shingle*, 1842, ii, 129; iv, 321; vi, 133; xi, 162, 206-19; xii, 528-53; xxiii, 227-31; and KINAHAN, *Travelling of Sea-beaches*, lviii, 281; in INSTITUTION OF CIVIL ENGINEERS, *Transactions*. SILT. 23.

SHINGLES (Lat. *scandulæ*; Med. *chyngil*, *shindle*; Sp. *alfagia*; Fr. *essentes*; *bardeau* or old stave, 9 in. by 3 in.; Ger. *schindel*). Small pieces of wood, formerly called "shides", used to cover houses in the same way as tiles or slates. The shingle is usually 8, 10, 12, or 18 in. long, 4 or 6 in. wide, and 1 in. thick tapering to one end, and fastened to rough boarding by pins or nails. In England, in XI and XII cents, the houses, according to NECHAM, were roofed with stone shingles or tiles, both of which were generally oval-shaped having a nail-hole in the upper part; illustrations from MSS. are given in TURNER, *Domestic Arch.*, 8vo., Oxford, 1851, i, 8. Shingles of the same form were used by the Romans (*SCANDULÆ*); a number were dug up on the supposed site of a Roman building in Micheldever wood, Hampshire. Salisbury cathedral was first covered with wood shingles cut from the Bramshaw woods, New Forest. MORRIS, *On British Carpentry*, mentions Nursted court and Aldenham church, Herts; BUILDING NEWS, 1870, xviii, 246. The stone coping of some of the buttresses of Lincoln cathedral are cut in imitation of shingles, as are many stone spires on the continent.

The Appendix to DE LA QUÉRIÈRE, *Essai sur les Girouettes, etc.*, 8vo., Paris, 1846, p. 55, gives *Décorations obtenues avec l'essence ou avec l'ardoise*. Employed in XV and XVI centuries, dressed and formed into shapes to cover the external work of timber houses, the tympanums of the gables, and the roofs; they are still used for the same purpose and to bell towers in the country, windmills, and some houses in Basse Normandie, as they offer less resistance than slate to the action of the wind. Several examples existed at Rouen, where shingles appear to have been abandoned in XVII cent. for slate. At Vire in Normandy is a house black with age; and an old house in the rue des Teinturiers has a front covered with shingles; MACQUOID, *Tour*, 8vo., London, 1874, p. 527; another at Orbec, p. 333. At Holzkirche in the Tyrol; WEBB, *Cont. Ecclesiology*, 8vo., 1848, p. 171. Some curious forms occur in SCHUBLER, *Sciagraphia artis tignaria*, fol., Nurm., 1736, pl. 22, 23. Slate shingles appear chiefly in Normandy and Anjou where slate is quarried, as at Troyes, Lisieux, Falaise, and Verneuil.

Where oak abounds wooden shingles should be employed instead of thatch in all outhouses, and especially in all garden summer-houses. If made of winter-felled oak, they will last for fifty years; the pleasant grey they put on in the third year is more pleasing than the red tiles; they are cooler for cattle than either tile or slate, and can be made by any clever out-of-door man; moreover they are very light. To preserve shingles, the roof should be covered with slacked lime put on thick once a year; and they will last for 30 or 40 years; BUILDING NEWS

Journal, 1856, ii, 806. Besides oak, other woods that split easily are mentioned; as Tulip wood; the Ash of *Fraxinus quadrangulata* (MICHAUX, *North Amer. Sylva*, iii, 210; 233-46); in Trinidad, the coarse-grained strong wood of *Bucida buceras* (Olivia); its diameter ranges from 2 to 4 ft.; also CEDAR, the *Cupressus juniperus*, or *oxycedrus*; CASTANEA; EPERUA; LARIX; and in Sweden, the *Pinus sylvestris*, for common buildings, split not thinner than nine pieces to an inch, and steeped in sulphate of iron or copper for preservation and protection from fire; said to last fifty years; *BUILDER Journal*, 1862, xx, 924.

In Canada, shingles are made in vast quantities; a circular saw cuts them 16 in. long, 3 to 9 in. wide, and of a thickness tapering from an inch to $\frac{1}{2}$, at the rate of from 7,000 to 10,000 per day. Notice of a new mode in America of cutting shingles; CIVIL ENGINEER, ETC., *Journal*, 1864, xxvii, 307. DOWNING, *Country Residences*, 8vo., New York, 1850, p. 180, gives three forms into which the end of each shingle is cut; and states that a shingled cottage, properly built, is warmer than one weather boarded in the common way, and is at least fully as durable. VAUX, *Villas and Cottages*, 8vo., New York, 1857, p. 61, states a shingle roof "is scarcely possible to get out of order till the wood absolutely rots, and this takes many years to accomplish."

During the American war, sir James Wright of London invented an artificial slating, which was in great request in the West Indian colonies as shingles were not then to be readily obtained; it consisted of coarse paper dipped in boiling tar, nailed on boards and painted with pitch, powdered coal, chalk, or brickdust; PAPWORTH, *Rural Residences*, 8vo., London, 1818, p. 36. Metallic shingles, patented in America 1877, are now 1881 manufactured at Wolverhampton. 1. 4. 13. 19. 23. 71.

SHINGLING, or "chynglyn" a window. "Fastening up before it a framework of splines as a protection against falling stones, etc. Reed was used for a similar purpose"; TYMMS, *East Anglian*, i; ii, 18; 149; iii, 200.

SHINGLING IRON. Iron after fusion is passed through the tilt or trip hammer to force out the cinders; this operation is called shingling. 1.

SHINLOG. In brick and pottery making, pieces of bricks piled on each other with wet brick earth instead of mortar. It is made so high that there is just room above the shinlog and the top of the mouth of the kiln to thrust in the faggots to make the kiln look white with heat. 4.

SHINTOO. The temples built in Japan, in imitation of the early temples of the Shintoo religion, prior to the introduction of Buddhism about 552 A.D., have roofs of two plane sloping surfaces, very salient at the ends and at the eaves; it seems from this that the heavy carved and hipped roof, which now abounds so in Japan, was an introduction from Corea or China, and came with the religion of Buddha. The principal Shintoo temple is the Kudanzaka at Yedo; the temple grounds are open, and entered under a structure called a *torii*, composed of two upright posts of great thickness, 12 ft. apart, a timber lintel is placed across the top projecting considerably. When placed before a Buddhist temple these *torii* (TA) are of stone. CONDER, *Notes on Japanese Arch.*, read at ROY. INST. OF BRITISH ARCHITECTS, *Sess. Papers*, 1877-78, p. 181; 186; 191.

SHIP BUILDING. The chief timbers employed are:—

- I. English oak; see QUERCUS.
- II. American Live oak; see OAK, p. 2.
- III. African oak, African teak, or mahogany; see OLDFIELDIA or Swietenia.
- IV. Morung saul of India; see SHOREA.
- V. East Indian teak; see TEAK.
- VI. Greenheart of Guiana; see GREENHEART.
- VII. Morra of Guiana; see MORA.
- VIII. Ironbark of Australia, since May 1851; see IRON WOOD.

WHAY, *Timbers, etc.*, in SOCIETY OF ARTS *Journal*; BUILDING NEWS *Journal*, 1859, v, 454, and increased supplies, p. 467-8. *Colonial Timber*, in SURVEYORS' INSTITUTION, *Trans.*, 1878-79.

SHIRAZ; Chiraz; Chiras; Chyrāz. A town in the province of Fars, and formerly the capital of Persia. It was almost

entirely destroyed May 1853 by an earthquake. One of the six gates forming the principal entrance opened upon the gallery 40 ft. wide of a bazaar, nearly half a mile long, one of the handsomest in Persia. The glass manufactories are extensive. There were thirty mosques, of which the Shah-Teherah was the best, and one of the most ancient sanctuaries of Shiraz; the fine mausoleums of the poets Hafiz and Sadi; and the Ark or governor's palace. CHARDIN, by LANGLEL, *Voyages en Perse*, 8vo., Paris, 1811, 66 pl., atlas, viii, 417. KER PORTER, *Travels, etc.*, 4to., London, 1821-2. R. C. M., *Tour in Persia*, 8vo., Lond., 1828. MYERS, *Remains of Lost Empires*, 8vo., 1875, p. 287; 302. FLANDIN AND COSTE, *Voyage en Perse moderne*, fol., Paris, 1844, ii, text, 221; which gives pl. 47, pont Kadjiou; pl. 84-7 tour des mamacenis; palais de Bagh Nô; palais de l'Ark; and tombeaux de Saadi et de Hafiz. 14. 50.

SHIPPON and Shuppen. In the north of England, the common name for a cow house.

SHIRE HALL. The same as COUNTY HALL. The former is usually applied in England, the latter in Ireland. ASSIZE COURT. COUNTY COURT.

SHITTIM WOOD. By some writers, the Ark of the Covenant is now thought to have been made of Lign Aloe, which is permanently odorous, but is translated "Shittim wood" in the authorised version of the Scriptures. It was, perhaps, the *Acacia horrida*, a kind of *Mimosa*; growing in the deserts of Arabia, and like the whitethorn in its colour and leaves, but not in size, as the tree is so large that it affords very long planks. The wood is hard, tough, smooth, without knots, extremely beautiful, and "never decays". 23.

SHIVERS, Shives, or Shyvers; also Sheaf and Sheaves. The wheel of a pulley or block. Probably also the chips made by a mason, otherwise GALLET (Lat. CEMENTUM).

SHOAR. Old way of writing SHORE.

SHOE of a pile (Fr. *laratoire*; *anot*). The end of a balk of timber, called a pile, is generally shod with a wrought iron shoe of a weight from 10 to 15 lb. to enable the pile to penetrate the ground when driven in. 1. 25.

SHOE. The part at the bottom of a rain-water trunk, or pipe for turning the course of the water away from the wall when carried only on to the surface. Even when the pipe is carried into a drain underground, it may be useful to put a shoe above ground in case of the stoppage of the drain. The château Josselin in France, erected xv cent., has a number of "belles gouttières avec leurs descentes terminées par des têtes d'animaux"; published at large by Noël aîné after drawings by Vauzelles, and in small in L'UNIVERS PITTORESQUE, France, pl. 433. SHUTTER SHOE.

SHOLE. A piece of plank put under the shore, in shoring up, where there are no ground ways. 23.

SHOOT. The same as SHAFT. Where applied for the removal of dust and ashes, the Americans appear to write the term, "Ash Chute", and make it 8 in. by 8 in. and 8 in. by 12 in.

SHOOT. A vacant piece of land, on to which excavators are allowed to cart, or shoot, rubbish or soil, generally for the purpose of filling up the site to a higher level.

SHOOT (JOHN); properly SHUTE (JOHN).

SHOOTING. The same as LISTING. To obtain a very straight edge to a board, the plane called a *joiner* about 2 ft. 6 in. long, is used; with it the shaving is taken the whole length of the joint or edge. The planing of a board out of winding is also so called. SHOT JOINT. 1.

SHOOTING BOARDS. Two boards joined together with their sides lapped upon each other, so as to form a rebate for making short joints. By this instrument are made the joints of the panels of framing, the mitres of architraves, and such like. NICHOLSON, *Dictionary*, 1857. 1.

SHOP. A place for the exhibition and sale of goods. Those of the ancient Romans are best shown in the works at Pompeii. The mediæval shops had the fronts so made that the lower half

of the boarding which secured the front fell down and was supported when horizontal by legs, which thus formed a platform at about 3 ft. high on which goods were exposed for sale. The upper part being hinged at the top lifted up and formed a protection from the rain and sun. They are shown in VIOULET-LE-DUC, *Dict. Rais.*, s. v. *Boutique*. TURNER AND PARKER, *Domestic Arch.*, 8vo., 1848-59, i, 96; iii, 36. The so-called "oldest shop in London" is the one in Macclesfield Street, Soho, built about 1690, represented 1883 by the Society for Photographing Old London; but No. 44, Fenchurch Street is probably of earlier date. At Newcastle in 1854, a shop front was put up 89 ft. long, 32 ft. high, supposed to be the largest in England. An account by DEFOE, *The Complete English Tradesman*, 8vo., 1732, i, 257, of the fitting up of a pastrycook's shop, is given in ARCHITECT *Journal*, 31 July 1885, p. 71.

SHOP FRONT OR WINDOWS, were in 1736 stated to be "afforded at the same rate as plain or battened doors, besides the ironwork". 4.

THIOULET ET ROUX, *Menuiserie*, fol., Paris, 1825, pl. 55-60. WHITING, *Original Designs*, etc., 4to., 25 pl., 1834. ROBINSON, *Shop Fronts—for every Trade*, etc., 25 pl., 4to., Derby, 1870. OGDEN, *Studies in Mercantile Architecture*, fol., 50 pl., 1877. BUILDING NEWS *Journal*, 1870, xviii, 293; 313: *Construction*, 1867, xiv, 797 and plate. Iron front for Portland, U.S., *idem*, 1869, xvi, 247 and plate. BUILDER, BUILDING NEWS, and ARCHITECT *Journals* passim; and illustrated publications of foreign civil buildings. CUMMINGS AND MILLER, *Street Architecture*, 52 pl. WHITTOCK, *Shop Fronts of London*, 4to., 1840. LAUGHER, *Select Designs*, 1852.

SHORE, formerly SHOAR (Lat. *anterides*, shore, posts, or props; *tibicines*, shoiers, props, staies, undersettings, HIGINS, *Nomenclature*, 205, 212. Fr. *chevalet*; *étai*; *couche*; *étaiçon*, *étréillon*, or strut; *étalement*; *butte*; *accore* or stay. Spa. *asnilla*. Scotch, *rance*). A prop, or an oblique timber, applied to a wall to keep it upright or steady. The upper ends of shores usually rest against that part of the wall into which a floor is inserted, making a counter resistance to their action. Both ends of the shores should rest on or against plates or beams, which when firmly fixed will form a much stronger resistance than could be obtained without them, and they should be tightened between the plates by wedges driven under the lower ends.

SHORE-UP, or SHORING, or shoring up (Fr. *buter*; *étréillon*; *bâtiment d'échine*). Shoring is of two sorts:—upright, Fr. *chevalement*; Ger. *unterstützung*; with needle, Fr. *chapeau*; Ger. *kappe*; *cuerhols*; with post, Fr. *étai*; Ger. *gerade stütze*; *raking*, Fr. *étalement*; Ger. *stutzen*; with shore, Fr. *étai en queue*; Ger. *schrage stütze*; the plates, Fr. *couches*. "In shoaring, the master carpenter charges one-third for 'use and waste'; when used in very considerable quantities and in large sizes, one-fourth is deemed sufficient"; NICHOLSON, *Arch. Dict.* GROWING SHORE. DEADSHORE. PROP. PROPPING. STAY. SHOLE. JACK SHORE. NEEDLE. NEEDLING. ROMBERG, *Zimmerwerks baukunst*, fol., Leip., 1846-50, pl. 144. TREDGOLD, *Carpentry*, edit. by Hurst, 1871. SPON, *Arch's and Builder's Pocket Book*, 1881, p. 138. DALY, *Revue Générale*, 1841, ii, 392, pl. 17. MALPAS, *Builder's Pocket Book*, etc., 18mo., Lond., 1852, p. 65-80. RONDELET, *L'Art de Bâtir*, 1812, pl. 135; Suppl., 1847-8. BARTHOLOMEW, *Specifications*; gives notice for shoring, App. I. BUILDER *Journal*, 1859, xvii, 341, gives from the ENGINEER *Journal*, the iron box girder used while underpinning at the Royal Bank at Dublin; also CIVIL ENGINEER, etc., *Journal*, xxiii, 98-9. MORRIS, *On Posts and Shores*, BUILDING NEWS *Journal*, 1877, xxxiii, 189. VIOULET-LE-DUC, *Dict. Rais.*, s. v. *Construction*; Contre ficelle. BURNELL, *Operations at Chichester and Bayeux*, read at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1860-2; SCOTT, *Tower of S. Mary's Church, Stafford*, 1860-62; and SEDDON, *Grosmont Church*, 1873. STOCK, *Shoring and Underpinning*, 8vo., London, 1882. BLASHILL, *On Shoring*, etc., in BRITISH ARCHITECT *Journal*, 20 March 1885, p. 140; and in other journals.

ARCH. PUB. SOC.

SHOREA ROBUSTA; the SAUL or SÂL, and Morung saul. A timber of the Woods of East India, of the first class, one of the eight chief timbers used in ship building. The sâla tree under which Gautama Buddha died; the vatica or vateria robusta; as stated in NOTES AND QUERIES *Journal*, 1883, Ser. 6, viii, 452. It weighs from 43 lb. 14 oz. to 52 lb. 10 oz. per cubic foot. It is close grained; of a light brown colour; not so durable, but stronger and tougher than teak; it well resists strains; the Sissoo (*Dalbergia*) is the next in esteem, and then teak in regard of strength. Hopea odorata is a species. 71.

SHORT. In mixing lime and sand for mortar, if the sand be in excess, the mortar becomes "too short", as the workmen style it; it not being sufficiently plastic at first, and may eventually crumble to pieces.

SHORTHOSE (JOHN), master mason 1678 in the city of London, was 1686-7 master of the company of masons.

SHORT IRON; see COLD SHORT and RED SHORT, in wrought iron.

SHOT HOLE; see LOOP HOLE and its illustration.

SHOT JOINT. Two pieces of wood are shot, or planed, or else pared with a paring chisel; they are shot or pared so exactly straight that when set against each other no light can be seen. This is called shooting or paring of or to a joint; MOXON, *Mechanick Exercises* (Joinery), 4to., London, 1701, p. 59. BOARDING. SHOOTING.

SHOT TOWER. A tall structure erected for the special manufacture of lead shot. ARTIZAN *Journal*, 1858; 1859, p. 30, 85, 114, and plates. A cast iron shot tower at New York, 25 ft. diam. outside at bottom and 15½ ft. at top, height 174 ft.; BUILDER *Journal*, 1855, xiii, 616. 14.

SHOULDER (Gr. *ous*). The enlargement of the architrave to a door or window generally at top, but sometimes also at the bottom. It has received various names, as EAR, ELBOW, KNEE, TAIL, CROISSETTE, crosette or crossette, ANCONES, and PROTHRYIDES. TENON.



SHOULDERED ARCH. A square-headed trefoil arch or shouldered arch, as shown in TURNER AND PARKER, *Domestic Arch.*, 8vo., 1853, ii, 230.

SHOULDER PIECE, shouldering piece (Fr. *croisette*). In stone, the projecting piece of a tapering stone of an arch, resting on the horizontal course. In timber work, a projecting piece, also called bragger, and now corbel (BRACKET). 2. 16.

SHOULDER WEDGE (Fr. *chantignolle*). The block of wood secured to the upper side of the principal rafter of a roof truss, to sustain the purlin.

SHOUMACHER (J.); see SHUMACHER (J.).

SHOUT (WILLIAM), not Shute, "master of the masons" from about 1802 to 1827 on the restorations at York cathedral; including the west front and its towers, the principal figures being by M. Taylor, sculptor at York; the south side of the lower roof of the nave; and the east end (where he omitted most of the leafage to the transoms of the window). He was succeeded about 1829 by John Scott, who died Dec. 1834. BROWNE, *York Cathedral*, 4to., London, 1847, p. 44; 318.

SHOUT (.....), built about 1765 (1764-71) the bridge of five arches over the river Tees, near Stockton; WILKES, ENCYC. LONDON., 1810, s. v. *Architecture*, p. 126. BRAYLEY, *Beauties of England*, 1803, v, 108. Probably the same ROBERT of Helmsley, born at Castle Howard, Yorkshire, who was 1785 mason and bridge builder of Sunderland; 1788 designed a bridge of large span over the river Wear; drawing in sir John Soane's museum; built Winston bridge, Durham; and the stone parts of Hexham bridge. His son John with himself were "architects and engineers to the port of Sunderland", 1779 to 1796; LANGLEY, *Builder's Jewel*, 8vo., 1741. This son JOHN, born at Helmsley,

mason to the port of Sunderland, died June 13, 1781, aged 42, at Stockton-on-Tees. His son ROBERT resided on his property at Treherne House, West End Lane, Hampstead, Middlesex; and his son Charles Lutwyche resided there, died 10 May 1855 aged 60, and was buried at Hampstead.

His son ROBERT HOWARD, born 5 July 1823, was a pupil of William Tress of London. He commenced practice about 1850 in the west of England, residing at Bristol, Sherborne, Yeovil, and Dorchester. He was engaged in the restoration and partial rebuilding of many of the small churches in Somerset and Dorset, and in the erection of schools, parsonages, farm buildings (as 1860 at Chiselborough, Somerset; *BUILDER Journal*, xviii, 808), cemeteries, and residences in that district, including the careful restoration of Yeovil church. The new parish church at Evershot, the cemetery at Yeovil (*idem*, xviii, 628), and the recast of Mr. Messiter's mansion, near Yeovil, are amongst the best of his works. Among his clients were the earl of Ilchester, lord Digby, and lady Fane; and for Mr. Doddington he designed a large set of farm buildings at Horsington, Somerset, his last work. He died 15 March 1882, aged 58, and was buried in Brompton cemetery, London. *BUILDER Journal*, 1882, xlii, p. 385.

SHOVEL. An instrument of various shapes, for lifting, etc., of soil or dirt, as in clearing away. **BEATER. RAKE. SPADE. SERVER.**

SHOWER BATH. An apparatus supplied from a cistern generally of cold water and fixed near a ceiling, to cause a descent of water through perforators on to the head of a bather. It now forms an adjunct to the usual bath fittings in an ordinary house. The plans, etc., of a public shower-bath establishment as fitted 1878 at Berlin, and in 1883 at the Berlin exhibition, are given in *SANITARY ENGINEER Journal* for October 11, 1883, p. 441-2.

SHREADING and Shredding, also called furring and Furring (Fr. *cogneau*; Ger. *aufschiebling*). A short piece attached to the foot of a rafter in old houses, making a small knee or angle outwards and downwards, for the purpose of carrying the eaves beyond the line of the wall. **MOXON, Mechanick Exercises** (Carpentry), 4to., London, 1694, description to plate, p. 143; 169.

1. 17.

SHREAD HEAD; see JERKIN HEAD.

SHRINAGAR, formerly SERINAGUR, Sirinagur, and Suryanagar. The capital of Kashmir, extending about two miles along the left bank of the river Jailun or Jhilam, which is crossed by seven bridges. The fort built 1590 by Akbar contains the palace and the Maharaj ka mandir or king's temple, covered with gilt copper plates. At the top of a hill 1,083 ft. high, the Takht-i-Sulaiman, is a Buddhist temple, built 220 B.C. by Jaloka, son of Ashoka. The shah Hamadan mosque, of cedar, is said to accommodate 60,000 persons. Nearly opposite is the new or stone mosque, now used as a granary, 180 ft. by 240 ft. **ARIAN ARCHITECTURE. HINDOO ARCHITECTURE. MARTUND**, now Marttand. Avantipur, Bhaniyar, and Payech, are other places of note in Cashmere. **NAGA ARCHITECTURE. HARDINGE, Recollections of India**, fol., 1847. **CAPPER, Three Presidencies**, 8vo., 1853. **WILSON, Annals of Cashmere. BURNES, Travels in Bokhara**, 8vo., 1834. **ELPHINSTONE, Cambul**, 4to., 1815; 1818. **MYERS, Remains of Lost Empires**, 8vo., 1875, p. 388. **LAMBERT, Trip to Cashmere**, 1877. *Kashmir Handbook, Guide for Visitors*, 1867. **COLE, Illust. of Ancient Buildings in Kashmir**, 50 photos, fol., 1869. **JACQUEMONT, Voyage dans l'Inde**, 4to., Paris, 1835-44. **DANIEL, Antiquities**, in IV series, gives a rope bridge. **DELAPOORTE, Voyage au Cambodge**, 8vo., Paris, 1880. Other works named s. v. **NAGA ARCHITECTURE.** 28.

SHRINE. A decorated memorial or entombment of saintly, royal, and noble, personages. The term is also applied to a reliquary or enclosure (*feretrum*) of rich workmanship in which sacred things are deposited. The shrine of the *patron saint* was placed immediately behind the reredos, in a retro-choir, as that of S. Hugh at Cluny; S. Louis at S. Denis; others at

Winchester, S. Alban's, Bury, Durham, Bridlington, Lincoln, Lichfield, Oxford, Westminster, and Canterbury. The magnificent altar of the cathedral at Arezzo, where repose the ashes of S. Donatus, bishop and martyr, by Gio. Pisano, commenced 14 Dec. 1362, which, if the tomb of S. Augustine at Pavia be excepted, has none to surpass or equal it. The shrine of S. Alban in the abbey church at S. Alban's, was discovered in more than 2,000 fragments, mostly of Purbeck marble with a few of clunch, dating about 1302-8, which formed the pedestal or base whereon had rested the *feretrum* or portable shrine containing the bones of the protomartyr; these fragments were ingeniously put together again by the clerk of the works. It is said to be one out of only seven pedestals now remaining in England. **LLOYD, Arch. and Hist. Account of the Shrines of S. Alban and of S. Amphibalus**, 8vo., S. Alb., 1873; **ARCHITECT Journal**, 27 April, and **BUILDER Journal**, 4 May, 1872; **ASSOCIATED SOCIETIES, Reports and Papers**, 1876, p. 261; 1878, p. 125. This shrine is compared with the Cantilupe shrine, 1282, at Hereford, in *BUILDING NEWS Journal*, 1877, xxxiii, 330; 372. **PUGIN, Glossary**, 4to., London, 1844; 1846. **LOVEDAY, On Shrines**, in *ARCHÆOLOGIA*, 1751, i, 23; and iv, 57; x, 469.

The shrines of *saints* were placed in subordinate positions, as in the choir transept at Rochester; south transept at Chichester; north side of the choir at S. David's; that to S. Oswin at Tynemouth priory is against the east end of the choir; *BUILDER Journal*, 1858, xvi, 194. The bronze shrine of S. Sebaldus at Nuremberg; the gilt one of S. Godehard, *cir.* 1131, four feet long, at Hildesheim, are remarkable. The stone shrine of S. Peter the martyr, 1337, in the church of S. Eustorgio at Milan; in *BRITISH ARCHITECT Journal*, 1885, May 22. A watching loft was formed to observe the shrine; **EXCUBATORIUM; LOFT.** A list of shrines, images, etc., in Norfolk, to which pilgrimages were made is given in **TAYLOR, Index Monasticus**, fol., 1821, p. 66; and in Suffolk, p. 117. Elaborate tombs are so-called shrines, such as those to bishop Fox, which was glazed; bishop Waynflete, and cardinal Beaufort, in Winchester cathedral.

SHRINE CHAPEL. A small enclosed place containing the tomb of a sainted person; such as that at Tynemouth mentioned in the previous article.

SHRINE WORK or Tabernacle work, as used by **DALLAWAY, English Arch.**, 8vo., edit. 1833, p. 61, 200. The elaborate tracery of canopies, gables, etc., at Chartres cathedral surrounding the choir, consisting of 45 compartments, having about 250 figures each 3 ft. high; the whole in very delicate workmanship. **WOODS, Letters**, 4to., London, 1823, i, 53.

1. 19.

SHRINKAGE or SHRINKING. In timber, it is proportional to its breadth, the length not changing. "The crossway of the wood will shrink in drying, and lengthways its shrinkage will be insensible"; **TREDGOLD, Carpentry**, 1828, p. 166. **EXPANSION. DILATATION. BATTENS** are used in good floors to avoid this shrinkage. A rod of oak lengthens .000062 of its length. Mr. Penrose found that at Athens the wood rods were not reliable, as they shrank so much; **ROY. INST. OF BRIT. ARCHTS., Sessional Papers**, February 1877. Rods for testing settlements of buildings, as by **BARRY**, at Covent Garden theatre; *idem, Sessional Papers*, 6 Feb. 1860. During experiments in 1864 to test if timber shrunk while seasoning, split and sawn pieces, one part of each sample was left in the yard and the other in a warm place; a difference was at first detected, but eventually it was agreed there was no difference in length.

The blue, white, or red **GUM TREE** wood (**EUCALYPTUS**) has the peculiarity of being heavier than water, and of shrinking horizontally to a considerable extent. Good box-wood and lance-wood are approved by the Tithe Commissioners for verified scales for plans, as being next to metal for accuracy; ivory scales were rejected owing to their material variation of length; **HOLTZAPFFEL, Cat. of Woods**, 8vo., London, 1843, p. 47. Because wood does not shrink longitudinally, it is preferred to metal for the long pendulums of large clocks, to ensure accuracy in timekeeping.

SHRINKAGE of iron castings, in cooling. Pattern makers use a foot rule one-eighth of an inch longer than the standard foot, which allows for the shrinkage of iron. Brass is said to shrink $\frac{1}{16}$, tin $\frac{1}{8}$, lead $\frac{1}{4}$, and zinc $\frac{1}{2}$.

SHROUD, **SHAWDE**, or **CROUDE** and **Crowde**. At S. Paul's cathedral in London, in 1549, the "shrouds" was a place used instead of the preaching cross in foul and rainy weather, and called S. Faith's church; that is, the undercroft or **CROUDE**. **CROFT**. **CRYPT**.

SHROUDED EFFIGY or corpse tomb; see **SKELETON**.

SHRUFF. The term given to old brass and old copper; old cast brass is called "yellow metal". Clean old copper, perfectly free from solder or brazing, ready for remelting; it is worth ten shillings per cwt. more than "brazery", which is copper that has been tinned, brazed, or soldered. R. R. R.

SHUARD (**HENRY**), was employed as clerk of the works under Mr. Blore at Crews hall, Cheshire; then at Mr. Strutt's mansion near Derby; then at Somerleyton, Suffolk, by Mr. Peto, who permitted him to practise as architect to those who had so employed him. He was returning from Keele hall, Staffordshire, where he was engaged on the estate of Mr. Sneyd, when he was injured in a railway collision, and died October 1848. *BUILDER Journal*, vi, 512; 527.

SHUFF BRICK; see **CHUFFY BRICK**.

SHUMACHER (**JAKOB**), or **SCHUMACHER**, and written Shoumacher, and Chumacher, of Colmar, built 1733 the foundry (giesshaus) in the arsenal at S. Petersburg, under field-marshal count Munich; it is 214 ft. long, 86 ft. wide, and 35 ft. high, with a tower 154 ft. high; the arsenal (*zeughaus*) at Moscow, and other buildings; and died 1764 at S. Petersburg. 68.

SHUPPEN. A cow house; see **SHIFFON**.

SHUSH, Sus, Shushan; see **SUSA**.

SHUTE (**RICHARD**), probably a steward, reported 30 July 1578 to lord Burghley on the progress of the works at Burghley house, near Stamford; **ROLLS OFFICE**, *Calendars*, *Domestic Series*, 1856, p. 597.

SHUTE (**WILLIAM**), see **SHOUT** (**W**).

SHUTE (**JOHN**). All that is known about this "paynter and archytecte" as he styled himself, is contained in a memoir by **PAPWORTH**, in *BUILDER Journal*, 1873, xxxvi, 826-8. Shute published *The First and Chief Groundes of Architecture*, fol., London, 1563. It was "one of the first works published on architecture in the English tongue", **EVELYN**, *Account of Architects*, fol., London, 1664; 1696; 1707 (p. 40). **WALPOLE**, *Anecdotes*, etc., 1826. Other editions of Shute's work appeared in 1579 and 1584, but all are very scarce; a copy of 1563 is in the library of the Royal Institute of British Architects. To the above account may be added that in the list of New year's gifts presented 1599-1600 to queen Mary, "Suete painter" is mentioned, but it cannot be John Shute (as supposed by **NICHOLS**, *Progresses*, 4to., London, 1823, i, xxxv), as he died Sept. 25, 1563, and was buried in the church of S. Edmund the king, Lombard Street; the epitaph of 28 lines is given in *Stow*, *Survey of London*, 1633, p. 221, from which it might be inferred that he had published another volume on the art, or that some edifices had been erected from his designs. It is doubtful if he wrote the other works usually attributed to him.

SHUTTER. The boards or framed joinery to close and secure an opening, as a door or window.

1518 Joutters or shutters; **TURNER AND PARKER**, *Domestic Architecture*, 8vo., London, 1859, iii, 135, note.

1532-3 Four leaves for two windows "revetted with clenche nails"; **BATLEY**, *Tower*, 4to., 1824-25, i, app., xxxii.

1561 Shuttinge wyndowe of waynscott very good and fayre; **ASSOCIATED SOCIETIES**, *Reports and Papers*, 1866, p. 299.

Shutters are made lifting, hinged, sliding, and revolving or rolling either sideways or vertically. Where comfort is an object, inside shutters should be provided; and where security is essential, shutters of iron are now used. They afford a ready and effectual means of excluding light, and tend to keep

the room warm in winter and cool in summer, and usually afford some security against thieves. Plan s. v. Box of a shutter. The **FOLDS** are called "front shutters", the inner ones "back flaps"; they are made clamped, or framed with square or moulded panels. An outside shutter, **JALOUSIE**, or Venetian blind is often used in aspects exposed to the direct rays of the sun. **TRENDALL**, *Finishings*, 4to., London, 1833; 1848; and usual publications on carpenter's work. 1.

Rolling shutters on rails with wheels are shown in **MANDAR**, *Études*, 1826, pl. 65. Suspended sliding iron sheet shutters for a bank at New York, by Calvert Vaux; *BUILDER Journal*, 1858, xvi, 126. Bunnett's improved iron panel shutters as used in Paris, in several horizontal panels falling one behind another either to ascend or descend (1864).

Revolving shutters of wood or iron, worked by machinery, date from about 1840. Bunnett and Co. made a curvilinear revolving iron shutter worked with "the best worm and wheel gearing", fire-proof and thief-proof; the interlocking revolving iron shutter for shops, etc.; patent self-acting shutter with iron weights. Smith's revolving iron shutters, *BUILDER Journal*, 1844, ii, 208-9. *BUILDER Journal*, 1853, xi, 363, describes a shutter in Water Lane, Blackfriars, 51 ft. long, rolling round a corner; and another in Fleet Street, 24 ft. long and 18 ft. high; both by Clark and Co. A shutter at Limerick was 45 ft. long. Clark's new self-coiling convoluted shutters, brought out June 1858; being of metal or wood connected by bands or strips of tempered steel. Clark's corrugated shutters, patented 2 May 1872 and 1 Nov., described in *BUILDING NEWS Journal*, 1873, xxiv, 662; also 1878, xxxv, 229; 289. 1864; Clark's noiseless self-coiling revolving shutters in steel, iron, and wood, requiring no machinery or balance weights; also, improved self-acting wood revolving shutters with hardened steel bands; steel revolving shutters, fire- and thief-proof. Salmon Barnes and Co. of Ulverstone, revolving shutter and balanced in any position by counter-weights attached to a chain passing over the roller. Francis and Co., improved self-acting wood shutter of convex laths morticed and connected with steel and copper bands, etc. The improved folding lattice shutter patented by Rownson and Co.

Two antique marble shutters turning on pivots and sculptured on both sides, are to be seen near north-west angle of the anteroom to the sepulchral chamber in sir John Soane's museum, Nos. 413 and 415. At Torcello cathedral the windows of the south aisle have external valves or shutters each of a slab of stone; **WEBB**, *Continental Ecclesiology*, 8vo., 1848, p. 306. 28.

SHUTTER BAR. A flat iron bar, used for securing a row of shop shutters. It is let into a slot in the post at one end of the row, and secured at the other end by a bolt through the post, keyed inside. **SHUTTER SHOE**.

SHUTTER BLIND. A name sometimes given to the outside shutter, **JALOUSIE**, or Venetian blind. **LOUDON**, *Encyc. of Villa Arch.*, 8vo., 1833, p. 269.

SHUTTER BOARDS. The lower part of a window opening closed by a pair of shutters opening inwards, in common use in the xv and xvi cents. In Scotland, the upper part being filled with fixed glazing. There was a "centre stile" and the head is called "the cope"; examples are given in **SMALL**, *Scottish Woodwork*, fol., Edinb., 1878, pl. 51-6.

SHUTTER SHOE. A patent taken out Sept. 1846 by George Jennings for securing a range of shop shutters, dispensing with the old-fashioned shutter bar. *BUILDER Journal*, iv, 442. A shoe is fitted to the heel of a shutter and this fits into another shoe on the toe of the next one, having a slot in it which catches a pin let into the sill and so fastens the two leaves when locked together. Advertisements give woodcuts.

SHUTTING STYLE; also called **FALLING STYLE**, of a gate. **SHYVERS**; see **SHIVERS**.

SIAM. An extensive kingdom of south eastern Asia. The natives bestow great labour and expense on their religious edifices, constructed of solid masonry, covered with tiles, the

woodwork carved and gilded, and containing carved and richly gilt images of Buddha. BANGKOK, the present capital, Cambodia, Ayuthia or Yuthia, founded 1350 the former capital; Bata-bang, Tenasserim, Mergui, Tavoy, and Martaban. CRAWFORD, *Embassy to Ava*, 8vo., 1830; 1834. FREEMAN, *Hist. of Architecture*, 8vo., London, 1849, p. 50. DALY, *Revue Générale*, 1866, xxiv, 110, describes the ruins of Ancor-viat; and xxvii, 1868, pl. 12, gives a hut in the exhibition of 1867. FINLAYSON, *Siam and Hue*, 8vo., 1826.

SIBERIAN BUILDINGS. The whole of Siberia under the Russians was formerly comprised within one government, of which Tobolsk was the capital. But the country is now divided into two grand governments, which are called Eastern and Western Siberia, and each of these is divided into several lesser governments. Western Siberia comprises the governments of Omsk (the seat), Tobolsk, Tomsk, and Yenesei; Eastern Siberia those of Irkutsk (the seat), Ochotsk, Yakutsk, and that of the great peninsula of Kamtschatka. S. S. HILL, *Siberia*, 8vo., London, 1854, describes the pyramidal building on the banks of the Volga near Kazan to commemorate the victory of Ivan IV over the Tatars. At Krasnoyarsk on the river Teneseisk, a cathedral dedicated to S. Nicholas was 1848 nearly completed by Dentu, the architect; *BUILDER Journal*, 1854, xii, 384. WRIGHT and ALLOM, *China, etc., Illustrated*, 4 vols., 4to., 1840. *Pictorial Description, etc., of Ava, etc.*, 8vo. (Bohn), 1853. NEALE, *Residence at Capital of Siam*, 8vo., 1851. ATKINSON, *Oriental and Western Siberia*, 8vo., London, 1858. 14. 50.

SIBERIAN CEDAR, near Irkutsky; see CEDAR.

SIBTHORP or SYBTHORPE (ROBERT DE), was in 1370, 44th Edward III, clerk of the works at Shene, Eltham, and Rutherhuyth from 4th Oct. to 29th March following. DEVON, *Brantham Roll*, 4to., 1835, p. 282, 328, 398, 453, 488.

SICCATIF. The French term used for powdered dryers for oil paints, sold by Randall's of Bankside, Southwark.

SICILIAN MARBLE, or Bianca Chiara, or RAVACCIONE. The quarries adjoin the statuary quarries in Tuscany. It was comparatively unknown in England until introduced by sir F. Chantrey, who gave it this name. The ground is generally of a bluer cast than "veined" with dots of blue or black instead of streaks. *BUILDER Journal*, 1852, x, 379. **SOCIETY OF ARTS Journal, 1 June 1860, viii, 568. The name of "Sicilian" is stated to have been also given to this marble, either on account of the first vessel being called "Sicilia"; or from the marble having been taken first to Sicily and then on to England. SICILY, marbles of.**

SICILIANO (ANGELO IL), or il Ciciliano (near Tivoli) properly Angelus de MANIUS.

SICILIANO (ANASTASIO), was 1509 called to Genoa, where he effected several public works and restorations. 37. 68.

SICILY; ARCHITECTURE OF. It may be useful to note for reference some of the leading dates connected with the interesting series of styles in the island. B.C. 427 the first Athenian expedition to Sicily. 415 the second expedition. 409 second invasion of Sicily by the Carthaginians, who plundered Himera and Selinus; 406 Agrigentum, and settled in Sicily; driven out about 278-276 by Pyrrhus king of Epirus, except from Lilybæum. At the end of the first Punic war (264-241) the Romans succeeded in the western part of the island, and by taking Syracuse possessed the whole of it B.C. 241. The fortifications of Motya in the island of S. Pantaleo, and a fragment of the walls of Lilybæum, now Marsala, are of this period. Among the numerous remains of antiquity the most important are at SYRACUSE, AGRIGENTUM, TAORMINA, (and Roman) SELINUS, SEGESTA or Egesta; others are seen at Catania (R.), Lentini, Alicata, Messina, Mordica, Paterno, Tyndaris (R.), and Termini.

The plans of the Christian churches are nearly the basilican with transepts. Those of the Byzantine epoch are very few; the purest is a little chapel at Malvagna. About 440 A.D. the Vandals under Genseric. 489-526 Theodoric king of Italy added Sicily, which was 534 reconquered for emperor Justinian

by Belisarius. 827 the first Saracenic expedition from Kairwan, and Agrigentum and Minoa taken; 831 Messina; 835 Panormus; 878 Syracuse; 945 Panormus the residence of the emir; 962 Tauromenium the last hold of the Byzantines fell; Salemi was built by them near the site of the ancient Alicia. 1035 the local Saracens assumed power and became a prey to anarchy, favouring the Norman invasion.

About 1016 a party of knights from the duchy of Normandy, returning from Palestine landed at Salerno to visit the sanctuaries of Monte Casino and Monte Gargano. Soon after, Osmond Drengot and his two brothers with other relatives arrived at Capua, and increased by numbers settled in a district of Campania, where 1020 they built Aversa. A fresh band arriving with the sons of Tancred, count of Hauteville, near Coutances, in Normandy, entered the service of the prince of Salerno. In 1037 they assisted Maniaces of Apulia to expel the Saracens from Sicily; but being ill-requited they seized Melfi, Venosa, Ascoli, and other towns of Apulia, making Melfi (Amalfi) the capital. In 1053 Robert Guiscard or Wiskard, one of the sons, was count of Apulia, and recognised by pope Nicholas II (1058-61), in 1070 took BARI from the eastern emperors, their last stronghold, and became lord of all lower Italy; he joined his brother Roger who 1061 had invaded Sicily; took Salerno, but joining the war in the East, died 1085. Count Roger 1090 took Noto, the last Saracen garrison, and dying 1101 was buried at Mileto in Calabria. King Roger II, 1127 united the two dominions, was crowned 1130 at PALERMO, died 1154. His son William I died 1166, and his son William II raised 1174 the cathedral at Monreale, married Joan daughter of Henry II of England, and died 1189; Richard I of England landed in Sicily 1190-91. Constance, daughter of king Roger by his third wife, was married to Henry VI emperor of the Germans, who, after the death 1194 of Tancred, count of Lecce, was proclaimed king of Sicily, took prisoner Sybilla the wife of William II and her son, and putting him to death about 1195-6, ended the Norman dynasty. 1. 28.

SICULO NORMAN ARCHITECTURE; or Siculo-Romanesque; or Lombardo-Saracenic or Romanesque, as used in *Handbook for Southern Italy*, 1853, pref., lx. "Of the Lombard style of architecture, which was a combination of Roman and Byzantine, with the exception of the priory of S. Nicola at Bari, there are now few unmixed specimens of that style in the kingdom. For the Normans after their conquest of Sicily engrafted upon it the Saracenic style, producing that singular mixture which is now known as Lombardo-Saracenic or Romanesque. Of this style the purest examples now extant are: the cathedrals at Amalfi and Ravello"; Salerno has been greatly modernised; also the abbey of the Holy Trinity at Venosa; while the monastery of Sta. Eufemia founded by Robert Guiscard, and the abbey of the Holy Trinity, at Mileto, founded by count Roger of Sicily, were destroyed by the earthquakes of 1638 and 1783. There is no doubt that Sicily affords more decided and remarkable Saracenic buildings than the Peninsula; many fragments of strictly Gothic edifices. These will be seen chiefly at the following places—most of which are described in this Dictionary. Palermo, Messina, Catania, Syracuse, Agosta, Trapani, Girgenti: Melazzo, Taormina, Randazzo: Monreale, Nicosia, Paternò, Aderno: Sciacca, Bivona, Aragona: Marsala, Alcamo, Alicata: Mazzara, Modica, Noto, Castellamare, Palma, Salemi, Lentini, Geraci. Corbel at Pietraperzia, *Illustrations*, 1857-8, pt. 1.

The *Handbook* names only the following buildings of Norman work in Southern Italy: Bari, the church of the priory of S. Nicola with a crypt that presents "strongly the Saracenic style". Barletta cathedral; Lombard with a lofty campanile. Trani cathedral; rich Lombard with a lofty campanile. Benevento cathedral; Romanesque or Lombardic Saracenic; and cloister of Sta. Sofia (suppressed monastery), capricious peristyle composed of 47 columns in a Lombard style. Lecce cathedral; Lombard architecture. Cimitile has more early ecclesiastical remains than any other place so near Naples. Amalfi cathedral; a

very interesting specimen of the Lombardo-Saracenic, or as it is sometimes called, the Romanesque style, which the Normans introduced into Europe after the conquest of Sicily; *Illustrations*, 1857-8, pt. 2, s. v. Cloister. Ravello cathedral; founded xi cent. Salerno cathedral; 1084, so repaired that FORSYTH writes, "it exhibits portions of every style, with ruins from Pæstum; and is a style of itself." ALBERT, duc de Luynes, *Recherches*, fol., 1844, includes plates of Pouille, Melfi, Canosa, cathedral of S. Angelo; others at Troja, Bari, Trani, Bitonto, palazzo at Foggia, citadel of Sarrazins near Lucera, Castel Fiorentino, Castel del Monte, Andria, and Manfredonia. LEWIS, *Chronology of Buildings in Italy and Sicily*, in *BUILDER Journal*, 1849, vii, 243, 256, 318.

The Angevine rule in Sicily extended 1260-1282; followed by the Aragonese dynasty; 1415-95 the later monarchs and their viceroys; the Spanish viceregal period for both Naples and Sicily, 1505-1734; in the second half of the xvi cent. all the varieties of Gothic architecture in Sicily gave place to the Renaissance, and the Italian style was gradually introduced; 1734-1860 restoration of the Sicilian monarchy under the Spanish Bourbons.

The earliest records of the literature are contained in the *Biblioteca Siciliana*, by Mongitore, and the *Elogj d'illustri Siliciani* by Ragusa. TOMMASO DE VIVO, *Storia figurata del regno delle due Sicilie*, fol., Rome, 1835, 79 pl. SAINT NON, *Voy. Pitt. de Naples et de Sicile*, fol., Paris, 1781-6. DE NON, *Travels in S.*, 8vo., 1789. SWINBURNE, *Travels through S.*, 4to., 1783-5. BRUNET DE PRESLE, *Recherches sur les Établissements des Grecs en Sicile jusqu'à la réduction de cette île en province romaine*, 8vo., Paris, 1845. W. H. SMYTH, *Memoir of Sicily and its Islands*, 1824. GIRAULT DE PRANGEY, *Essai sur l'Architecture des Arabes et des Mores en Sicile*, etc., 8vo., Paris, 1841. CONDE, *Sicily by the Arabs*, i, 116; 396; 421. FASO DI PIETRA SANTA (duca di Serradifallo), *Antichità*, 4 vols., fol., 1834-42. HITTORFF and ZANTH, *Architettura Antiqua*, fol., Paris, 1870. GALLY KNIGHT, *Normans in Sicily*, 8vo., 1838; and *Saracenic and Norman Remains*, fol., 1840; 1846. PATERNO, *Viaggi per la Sicilia*, 1817. QUARTERLY REVIEW, *La Campania Sotteranea*, 8vo., London, 1836. SMIRKE, *Recollections of Sicily*, read 1860, at Roy. Inst. of Brit. Architects. HUGHES, *Travels in S.*, 4to., 1820. CUCINIELLO and BIANCHI, *Viaggio Pittorico*, fol., 1830-33. POWER, *Guida per la S.*, 1842. VIOLETT-LE-DUC, *Lettres sur la S.*, 1860. HULLIARD-BREHOLLES (le duc de Luynes), *Recherches sur les Monuments et l'Histoire des Normands et de la Maison de Souabe dans l'Italie Méridionale*, Paris, 1844. *Handbook to Sicily*, 8vo., 1864. PRINCIPE DI BISCIARI, *Viaggi per le Antichità della Sicilia*. BALSAMO, *Present State of Sicily*, translated by Vaughan, 1811. HITTORFF and ZANTH, *Arch. Moderne de la Sicile*, fol., Paris, 1835. PANCRAZI, *Antichità Siciliane Spiegate*, colle notizie generali di questo Regno, 55 plates, 2 vols., folio, Naples, 1751. ORTOLANI, *Biografia degli Uomini illustri della Sicilia*, 4to., Naples, 1817. HOUEL, *Voyage Pitt. des Isles de S.*, etc., fol., 1782-7. MUNTER, *Traces of the Religion of the Egyptians in S.*, 8vo., 1807. GOLDCUTT, *Antiquities of S.*, fol., 1819. GAERTNER, *Monuments de la Grèce et Sicile*, fol., 1819. HOARE, *Classical Tour*, 8vo., 1819. SCHULTZ, *Norman, etc., bauwerke in Kalabrien*, etc., 8vo., 1845-6. BARTLETT, *Pictures from Sicily*, 8vo., 1853. D'ORVILLE, *Sicilia illustrata*, fol., 1764. BRYDENE, *Voyage en S.*, 8vo., 1776.

SICILY; MARBLES OF. SMIRKE, read at Royal Institute of British Architects, 5 Nov. 1860. BARON BORN, *Sicilian Mineralogy*. BURNHAM, *Limestones and Marbles*, 8vo., Boston, U.S., 1883.

SICYON (formerly Aegialeia or Aegiali; also Mencone) now partly occupied by Vasilika. A city of ancient Greece, situated near Corinth, distinguished for its school of painting, the plastic art, and works in metal, according to PLINY. The pavements of the roads and streets may still be traced. The remains of the theatre show 313 ft. and 100 ft. exterior and interior dia-

eters. LEAKE, *Asia Minor*, 8vo., London, 1824, p. 322-9. BLOUET, *Morée*, fol., Paris, 1836, iii, pl. 81.

SIDE; now Eski Adalia or Old Attalia. The former chief port of Pamphylia, in Asia Minor. Extensive moles and artificial harbours are seen, with fine ruins, including the agora 180 ft. diameter; and the theatre 390 ft. and 120 ft. external and internal diameters, is of the largest size and is in better preservation than any in Asia Minor. BEAUFORT, *Karamania*, 8vo., 1817, gives drawings by C. R. Cockerell. LEAKE, *Asia Minor*, 8vo., 1824, p. 195; 320; 328. WALPOLE, *Travels*, 4to., 1826, p. 273.

SIDE ARM; see DOORCASE, and HORN.

SIDEBOARD. The ancient ABACUS. Also a fixed table having shelves with drawers and closets under, chiefly for the service of the DINNER ROOM. SERVING ROOM. BUFFET or beaufet. One of stone in a recess in a house in the Close at Lincoln, *cir.* 1320, is given in TURNER AND PARKER, *Dom. Arch.*, 8vo., 1853, p. 44. Ancient examples in WILLEMIN, *Monuments Français*; RIXNER, *Thurnierbuch*; MEYRICK in SHAW, *Furniture*.

SIDEBOARD of the bench; see SCREWBOARD.

SIDE FIRMER; see FIRMER.

SIDE HINGE. A form of hinge, undefined, and of which there were several sorts in use in 1700-36. Also in 1811 it was priced 6d. and 1s.; and 3d. per inch more.

SIDE HOOK. A rectangular prismatic piece of wood with a projecting knob at the ends of its opposite sides. It is used to hold a board fast, its fibres being in the direction of the length of the bench, while the workman is cutting across the fibres with a saw or grooving plane, or in traversing the wood, which is planing it in a direction perpendicular to the fibres.

SIDE POSTS. Posts placed in pairs in a roof truss at an equal distance from the middle. Their use is not only for the support of the principal rafters, braces, crown, or camber beams, but also to hang the tiebeam below. NICHOLSON, *Dict.*

SIDERITE. A phosphate of iron, and Olivine, are the colouring matters of basalt, and take their proportions with silica and alumina. BASALT.

SIDEROXYLON INERME, Milk wood; and S. Melonophleum, Iron wood, of South Africa, is hard, white, close grained, very tough, and sinks in water. It is obtained from 1 to 3 ft. in diameter.

SIDE SPACE. The distance on the outside of each line of rails; on private lines about 3 ft. 6 in.; 5 ft. on public; 7 ft. 1 in. on the North Western railway; and 4 ft. 9 in. on the Great Western railway; BREESE, *Illustr. Gloss.*

SIDE TIMBER. The term used in Somersetshire; and Side waver or weaver, in Lincolnshire and Yorkshire, for the purlin of a roof.

SIDING. The term used in Canada for feather-edge weather boarding; long wedge-shaped boards are cut by a circular saw at the rate of 17 ft. per minute. A "siding, passing-place, turnout, or shunt", on a line of railway, is an additional trackway connected with it by means of suitable curves.

SIDNACESTER or Lindsey. An Anglo-Saxon bishopric which was added to that of Lincoln.

SIDON or Saïda (anc. Saïda). One of the maritime cities of Phœnicia; mentioned in JOSHUA, and in the *Iliad*, bk. vi, was situated near Beyrouth, in Syria. The existing town is of the time of the Crusades; the ruins are chiefly of late date. "Their architects were the best in Syria"; and STRABO celebrates the acquirements of the Sidonians in astronomy, geometry, navigation, and philosophy. Of the old Sidon, some gigantic blocks are observed at the extremity of the ancient port. J. L. PORTER, *Giant Cities of Bashan*, 8vo., Lond., 1865; 1867; p. 275. POCOCKE, *Descr. of the East*, fol., London, 1745, p. 86. MARMIER, *Du Rhin au Nil*, etc., 8vo., Paris, 1846. CASSAS, *Voyage Pitt. de la Syrie*, fol., Paris, 1798, ii, pl. 79-82. During the researches in Syria by E. RENAN under the French Exploration, was discovered in 1855 a necropolis of great value, and from it was taken the sarcophagus of Eschmunazar, a king of Sidon, now

in the Louvre, of very Egyptian character; the excavations are described in *BUILDER Journal*, 1862, xx, 161-2. 14. 23. 28. 50.

SIENA (anc. *Sena Julia*; Fr. *Sienna*); written Sienna formerly in English. A principal town of Tuscany in Central Italy. The fortifications were devised 1460 by F. di G. Martini and *cir.* 1520 by B. Peruzzi, whose circular lunette was spoilt by recent alterations. Of the 39 gates in the lofty walls only eight are now open; the best are—porta Camollia, the Florentine gate; porta S. Viene or Pispini 1326 by Mocchio; porta Laterina 1528; porta Romana or Nuova 1321-7 by Agostino and Angelo da Siena (D'AGINCOURT, pl. 72, No. 6); and S. Lorenzo, close to the railway station, of which the tunnel at Monte Arioso was designed by prof. Pianigiani and opened 10th Oct. 1850. The supply of water was completed 1343 by an aqueduct of fifteen miles long by A. and A. da Siena, to the fonte Gaja formed 1334-42 by G. Vanni di Ugolino, sculptured 1412-19 by J. della Quercia; renewed 1869 by the sculptor Tito Sarocchi; a monograph of it was published 1868 (GRANDJEAN, pl. 92). Fonte Branda was (1190 VASARI) 1193 or 1198 renewed by Bellamino; 1248 restored or enlarged by Giovanni di Stefano di Siena; an upper story was supposed to be destroyed 1802 (GRANDJEAN, pl. 99). Fonte Nuova (Gothic) 1259, or 1298, by Camaino di Crescenzino, has the upper part also destroyed. Fonte di Fullonica begun 1249, was presented 1489 to the city by the native architect F. di G. Martini. They are described in *ARCHITECT Journal*, 1 Jan. 1876, p. 3-4 and plate.

Siena is the see of an archbishop. The *duomo*, dedicated to the Assumption of the Virgin, was begun 1059; enlarged 1087, and consecrated 1169, 1171, or about 1180. The façade to a lengthened nave was begun 1229-36 (or 1245) by N. Pisano (CICOGNARA, i, 197, considers it was by Lapo); but destroyed 1284 for one by his son Giovanni Pisano (*BUILDING NEWS Journal*, 1869, xvi, 65); and completed 1290 by L. Maitani; decorated as at present 1317 together with the north façade by A. and A. da Siena (1321 Lando was employed); and 1330-33 entirely covered with black and white marble in courses (the colours of the town), as is also the choir, faced 1250. The present façade is said by GALLY KNIGHT to date about 1380 by Giov. di Cecco; and the façade next the hospital was finished 1333 by Lasso. The cupola 1262 is an irregular hexagon. The east end was thrown down 1798, and in rebuilding the courses were not replaced with those on the sides, and the interior arrangement of the wall was altered. The two large round windows have no tracery but are filled with stained glass, *cir.* 1400 and 1549. The church is 289 Engl. ft. long, 170 ft. in transepts, and 80 ft. 6 ins. at nave and aisles. The pavement is unique, being of elaborate designs partly formed of lines cut in a dark grey marble inlaid in white, and filled in with black cement; some part is mosaic of coloured marbles; it dates from 1369 by Duccio to 1488 and part after 1500 by D. Beccafumi (Mecherino); RUPP, *Chiese*, shows them. They were repaired by Ant. Radicchi and Leop. Maccari, who 1875 made complete drawings of the subjects, these are in the Fitzwilliam museum, Cambridge; photographed 1876 by Lombardi. *WARING, Arts, etc.*, pl. 30 and 31. *ARCHITECT Journal*, 1849, i, 323; COLVIN, *History of a Pavement*, in *FORTNIGHTLY REVIEW*, July 1875. The stalls dating from 1387 were designed by maestro Riccio, *i.e.*, Bart. Neroni or Negroni, and carved by F. Tonghi, Bartolino of Siena, and Benedetto di Montepulciano, and completed 1506 by the two Barlis; the plate in *ARCHITECT Journal*, 1849, i, 327, gives the date 1569 for this work. The high altar *cir.* 1527 by B. Peruzzi; as well as a pulpit, of which a carved panel is given in *Illustrations*, 1857-8, pt. 1, Cinque Cento (pl. 89). The bronze tabernacle 1463-72 by Lorenzo di Pietro. The well-known *pergamo* was ordered 12 Sept. 1265 Pisan style, or 1266, and finished 1268 by N. Pisano with his sons Giovanni and Arnolfo and fra Melano Pisano. (*Illustrations*, iv, pt. 3, pl. 93 (pl. 227). *CIVIL ENGINEER, ETC., Journal*, 1850, xiii, 65 and plate. Cast in South Kensington museum.) Among the other buildings is the sacristy serving as the library, a part enclosed

from the north transept about 1450 for pope Pius II; it was painted *cir.* 1500 by R. da Sanzio with, or for, B. Pinturicchio; GRANDJEAN, pl. 97; its pavement XVI cent.; restored *cir.* 1820. *WARING, Arts, etc.*, pl. 32. A chapel on the left hand of the cathedral decorated with stuccoes by il Riccio, *i.e.*, B. Neroni. Circular chapel of S. Giovanni 1482 by G. di Stefano da Siena, perhaps the small former baptistery of S. Giovanni in the north transept. Under the choir is the new baptistery or church of S. Giovanni, dating 1317 by Giacomo da Mino del Pelliciajo (1243 in WEBB, *Cont. Ecclesiology*, 1848, p. 384), it is of purer Gothic than any other part; or finished by him 1382; floor 1486; fresco of vaulted roof, XIV and XV cent. *WARING, Arts, etc.*, pl. 16; and marble font early XV cent., pl. 37. HOPE, p. 442, states this chapel was built 1452 but in part left unfinished. The capella del Voto or capella Chigi, 1661 by B. Giovanelli for pope Alexander VII, rich with marbles and gilding; he also designed the marble front of the regio ritiro del Rifugio. The doorway to the cloister is given in *Illustrations*, 1857-8, pt. 2; Doorway (pl. 120). The brick campanile *cir.* 1100 by the Bisdomini, 1045-1178 by A. and A. da Siena with black and white marble coating and ornaments, it somewhat resembles that of S. Zenone at Verona; within it is a staircase round a square well-hole up to the bells.

By a decree of 1337 the present edifice was intended to be used as the transepts of a vaster one; the drawings dated 1337 by Lando di Macario still exist in the archives; the foundations were laid 1338 (he died 1340), the works stopped by the great plague of 1348-50, and were demolished 1357 under Domenico d'Agostino, *capo maestro*; the south front and nave and aisles portion are yet to be seen. There were probably some previous works, for while proceeding, five architects were appointed to inspect them, and a report dated 17 Feb. 1321 declares that the new work ought not to proceed further, as if completed, it would not have that measure in length, breadth, and height which the rules for a church require; and which the old portion possessed. DELLA VALLE, *Lettere Senesi*, 18, ii, 60; HAWKINS, *Gothic Arch.*, 8vo., 1813, p. 183. FRATINI e BRUNI, *Il Duomo di S.*, 8vo., 1818. GALLY KNIGHT, *Eccles. Arch.*, fol., 1842-4, ii. RUPP, *Eglises principales de l'Europe*, fol., Milan, 1824; 9 pl.; SEROUX d'AGINCOURT, *Architecture*, pl. 42, No. 10; details and plan, pl. 73, No. 49; CICOGNARA, *Scultura*, façade, i, pl. 3; MOYEN AGE MONUMENTALE, pl. 25; its interior, pl. 3.

Among the sixty churches including the chapels of confraternities may be noticed:—

- S. Agostino; 1258; restored 1468; and in 1755-73 by L. Vanvitelli. The cloister and convent occupied 1881 by the collegio Tolomei.
- Carmine conventual; *cir.* 1527 tower and cloisters by B. Peruzzi. There is a deep well in the courtyard.
- Sta. Caterina in strada Giulia; 1760 rebuilt by P. Posi.
- La Concezione or Chiesa dei Servi di Maria; 1388 by Agostino and Angelo; *cir.* 1527 church rebuilt by B. Peruzzi.
- S. Cristoforo; 1291 rebuilt by fra Melano Pisano.
- S. Domenico; 1221 or 1225-1465. It is 75 ft. wide (or 66 ft. 6 in. Engl., G. A.), spanned at its east end by a pointed arch of great boldness. The building was so injured in 1798 that it was not in use in 1803.
- S. Francesco and monastery; begun 1295, or 1321-7, consecrated 1326, by A. and A. da Siena. 1489 cloisters by F. di Martini. Now dismantled.
- Fonte Giusta; 1479-82 by F. Fedeli of Como. Elaborate tabernacle 1517 by Marrina.
- S. Giovanni; 1250-59; 1297-1315; next the building now the casa dell'opera del duomo, by N. Pisano. Font *cir.* 1448 by R. Pagno.
- Sta. Maria in piazza Manetti; *cir.* 1800 by A. da Siena.
- Sta. Maria di Provenzano; 1594, Greek cross.
- Sta. Marta; *cir.* 1660 the great cloister by B. Giovanelli.
- S. Martino; XII cent.; front XVII cent. by Gio. Fontana, though attributed to D. Fontana.
- S. Spirito; 1345; 1504 cupola; *cir.* 1527 doorway by B. Peruzzi.
- Oratorio presso S. Bernardino; interior, pl. 10, KÖHLER, *Polychr. Decorations*, fol., 1870-77.
- Oratorio di S. Giuseppe; 1663 façade by B. Giovanelli.
- Oratorio della Selva; 1527 by B. Peruzzi.

A façade in via del Corso, *cir.* 1527 is by B. Peruzzi (GRANDJEAN, pl. 99). The house of D. Beccafumi erected by himself,

cir. 1640 is of red brick. The loggia di S. Paolo 1470-20, now casa dei Nobile (? 1309 by Duccio) had the front restored 1763 by F. Fuga; a marble seat cir. 1527 by B. Peruzzi; view in WARING AND MACQUOID, pl. 17: and *Illustrations*, 1856-7, pt. 1, pl. 129, Arcade (pl. 15). Façade of a house 1460 for Carlo Bartoli (GRANDJEAN, pl. 96). Few of the *palazzi* have any courts. Among them are pal. Buonsignore formerly Tegliacci; XIII cent., Pointed style of brick with terra-cotta front; restored 1848; façade about 56 ft. long; BUILDING NEWS *Journal*, 1873, xxiv, 10, and two plates; window of upper floor in *Illustrations*, 1856-7, pt. 1, pl. 124, Brickwork (pl. 43). Pal. Bandinelli. Pal. Petrucci or del Magnifico; 1504 by J. Cozzarelli, who designed and cast the fine bronze *campanelle* (ornaments and rings) on the outer wall; *Illustrations*, i, pt. 2, pl. 20, Metal work (pl. 201). Pal. Piccolomini now pal. Governativo; 1460, by F. di G. Martini, for pope Pius II: a ring is given in *Illustrations*, 1861, pt. 1, Metal work (pl. 208); GRANDJEAN, pl. 89-91, who pl. 95 gives the loggia del Papa 1464 by the same architect. Pal. Pollini, cir. 1527 by B. Peruzzi. Pal. Pannilini or Rannalini, cir. 1387 by maestro Ricci, i.e., Bart. Neroni; also attributed to B. Peruzzi. Pal. Saracini. Pal. Sergadi or Colonna early XV cent., restored 1780 by P. Posi; plan in GRANDJEAN, pl. 93; which likewise gives plan of pal. Bianchi for the Elci family. Pal. Spanocchi, commenced 1471; from the modification of the Corinthian capitals it is attributed to il Rossellini, Bernardo di Firenze, properly called B. Gambarelli; WARING AND MACQUOID, pl. 15; GRANDJEAN, pl. 94. Pal. Tolomei; 1205 by il Tozzo; but much altered. Villa Rossi, plan in LECLERC, *Recueil*, fol., 1826, pl. 113. The episcopal palace, XIV cent., is said to deserve illustration.

Palazzo pubblico, 1287 or 1295-1309 by Agostino and Angelo; 1348-76 the chapel of the Virgin therein by Duccio (SPIELBERG, *Kapelle*, 7 pl., fol., Berl., 1862 and 1876; GRANDJEAN, pl. 103: inlay of stalls, cir. 1350, WARING, *Arts, etc.*, pl. 17). 1325-7 they built the attached lofty tower *della Mangia*; and 1344 the sala del Consistorio (GRANDJEAN, pl. 103 and dated 1327); frescoes by Meccarino di Beccafumi; cir. 1605 palace restored by B. Buontalenti (GALLY KNIGHT, II. *MOYEN AGE MONUMENTALE*, pl. 25; VERDIER AND CATTOIS, *Arch. Civile*, 4to., Paris, 1855, ii). Fresco of a vaulted ceiling, end of XIV cent. by Spinello Aretino, WARING, *Arts, etc.*, pl. 15. *MOYEN AGE, ETC.*, pl. 15. The University now in the Jesuits' college of S. Vigilio dates from 1203. The Library includes many architectural drawings, and occupies the great hall of the accademia degli Intronati, one of the oldest in Europe. Collegio Tolomei, founded 1668, now located in the monastery of S. Agostino. *Dogana*, partly 1198 cir. by Bellamino. Museum in the piazza del Duomo, contains fragments of the fountain, from the cathedral, and the Graces, 3 ft. high of white marble, found in XIII cent. under the cathedral. The casino, formerly a church, was the most splendid in Tuscany. The *Spedale* di Sta. Maria della Scala, a spacious Gothic edifice, one of the most ancient hospitals in Europe, founded 1332, completed 1489, contains over 300 beds; its church dates from XIII cent., but rebuilt in middle of XV cent., the organ case by B. Peruzzi is given in HILL, *Organs*, fol., London, 1883; the hall or ward called del Pellegrinajo, was for the use of the pilgrims on their way to Rome. The earthquake of 1797-8 did serious damage to many of the chief edifices; large restorations were being effected from 1850.

Outside the walls is the large Franciscan monastery of L'Osservanza; 1423 for S. Bernardino; and rebuilt 1458 by F. di G. Martini for Pandolfo Petrucci, il magnifico, died 1512 and buried there; the presses in the sacristy are by Barili. The church and convent of Sta. Maria Maddalena, by J. Cozzarelli, incomplete at his death 1515; and destroyed 1526. Belcaro, in XV cent. the residence of Crescenzo Turamini who cir. 1530 employed B. Peruzzi to decorate the loggia with frescoes, and also to design and decorate the chapel, several of which have been recovered and restored; GRUNER, *Fresco Decorations*, pl. 51, or No. xv of ecclesiastical portion. Palazzo at Castiglione, cello,

in GRANDJEAN, pl. 87: who pl. 88 gives façade of a chapel, at gate of Florence, and of XV cent. by F. di G. Martini. The round church of Madonna degli Angioli, on road to Rome, in Lombard style, is noticed in HOPE, *Architecture*, p. 281.

ROMAGNOLI, *Cenni Storico Artistici de' Siena e suoi suburbii*, 8vo., Siena, 1840. MILANESI, *Storia Civile ed Artistica Senese, ed Documenti per la Storia dell' Arte Senese*, 8vo., Siena, 1854-6. RUMOHRE, *Ital. Forsch.*, 8vo., Berlin, 1827-31, ii, 381, etc. MEUCCI, *Siena*. VALÉRY, *Voyages en Italie*, 1826-8; transl. by CLIFTON, 8vo., Paris, 1842. FALUSCHI, *Relaz. delle cose più Notabili di S.*, 1817. LALANDE, *Voyage en Italie*, 1769, ii. TAPPEN, *Prof. Observations*, 8vo., 1806, p. 124-130. FORSYTH, *Remarks, etc.*, 8vo., 1816, p. 100-7; 386-94. DENNIS, *Etruria, etc.*, 8vo., 1848, ii, 135-140. GRANDJEAN ET FAMIN, *Architecture Toscane*, fol., 1806; fol., Paris, 1875. WARING, *Arts connected with Architecture*, fol., 1858. WARING AND MACQUOID, *Architectural Art*, xiii-vi, fol., 1850. SCHMAROW, *Raphael und Pintur.*, 10 pl., 1880. LOMBARDI, *Suppl. Cat. of Photos. of Siena*, 8vo., 1881. *Illustrations*, Metal work, 1859, pt. 2 (pl. 205), gives a flag support and shield; and Metal work, 1861, pt. 2, a grille (pl. 207). LASSELS, *Voyage through Italy*, 8vo., Paris, 1670; London, 1670; 1686; 1689. 1. 12. 14. 15. 28. 50. 96.

SIENA, Sanese and Senese, as a surname, as follows:—

(AGOSTINO DA with AGNOLO or ANGELO DA), supposed sons of the architect maestro Rosso da Siena, but lately considered not to have been relatives, also called Agostino di Giovanni and Agnolo di Ventura. The former was born 1279. They were the two great artists of the republic. Having studied 1284 under Giovanni Pisano, they were on his death 1317 appointed *capo maestri* to the town. 1295-1309 completed the palazzo pubblico; 1295 or 1321-7 began the monastery and church of S. Francesco; 1308 designed the palazzo in Malborghetto; 1317 designed and decorated the north and east façades of the duomo; 1321-7 the porta Romana, formerly S. Martin and Nuova; rebuilt at Tufi the gate of S. Agata all' Arco; and 1325-44 the hall in the palazzo pubblico, with its lofty tower; GRANDJEAN ET FAMIN, pl. 103, and dated 1327 by them. They then visited other towns and while at Bologna rebanked the river Po after an inundation. Returning 1388 they designed the church of Sta. Maria; and formed the aqueduct of lead and earth for 15 miles completed 1 June 1343. Agnolo went to Assisi to build a chapel in the lower church of S. Francesco; and died 1348 at Pisa. Agostino remaining at Siena died there 1350. Other works of sculpture in tombs and altars are at Arezzo, Pisa, Pistoia, Orvieto, and Bologna. CROGNARA, *Scultura*, fol., 1813-8, i, 390, etc. 1. 30. 68. 73. 96.

The following were employed at Orvieto cathedral, as stated in DELLA VALLE, *Storia del Duomo*, 4to., Rome, 1791. 1321 and 1337 LANDO DA; see L. di MACARIO: GIOVANNI DI M. AMMANATI DA, as *capo maestro* 1331 from Siena to direct the *tarsia* of the choir: 1337 GIOVANNI DI M. AGOSTINO DA (p. 112; 278): 1337-59 ANDREA DI SER GUIDO DA (p. 110-6): 1350 MATTEO DI M. UGOLINO DA (p. 380): 1356 ANDREA DI CECCO DA (p. 115-6): 1360-70 PAOLO DI MATTEO DA (p. 117, 380): 1370-3 GIOVANNI DI STEFANO DA, *capo maestro* (p. 117; 286) was 1369 selected by pope Urban V (1362-70) to rebuild the Lateran; GAYE, *Carteggio*, 8vo., Flor., 1839, i, 75: 1405 AGNOLO DA (p. 121); 1406 cir., SANO DI MATTEO DA (p. 380); 1412 CHRISTOFANO DI FRANCESCO DA, or CHRISTOFORO DA, when the west façade was being completed; in 1443 he is mentioned as very old and infirm (p. 122, 295-301, 380); GAYE, i, 87-91: 1447 see CECCO, as below (p. 119; 129): 1450 ANTONIO DI FEDERICO DA (p. 140): 1501-8 STEFANO DI ANGELO DA (p. 380): 1508 FRANCESCO DI AGOSTINO DA and was the first to whom the title of *Architecto* was given (p. 322 note, and not 360, and p. 380). 5. 30. 67. 68.

SIENA (ARNOLFO DA) and A. da Lapo; see CAMBIO.

SIENA (BALDASSARE DA); see PERUZZI (B. and G.).

SIENA (CECCO, i.e., FRANCESCO DI GIORGIO DA); see MARTINI (F. di G.), who was also known as Francesco Maurizio di Giorgio di Martino Pollajuolo; FRANCHETTI, *Storia—del Duomo*

di Milano, fol., Milan, 1821, 27 June 1490. A pupil of B. Peruzzi. In 1447 at Orvieto (p. 119, 129 of DELLA VALLE).

SIENA (FRANCESCO DI GIORGIO DA); see VANOCCHI (G.).

SIENA (GIOVANNI DI STEFANO DA), 1482-1504 as *capo maestro* designed the circular chapel of S. Giovanni Battista in Siena cathedral; also attributed to B. Peruzzi.

SIENA (MARCO DA); see PINO (M. DI); LINO DA; see TINO.

SIENA (MOCCIO DA); see MOCCHIO.

SIENITE; see SYENITE.

SIENNA, Terra di Sienna, or Raw Siena earth, is a crude natural yellow lake, of rather an impure yellow colour, but having more body and transparency than the ochres; and is little liable to change by the action of either light, time, or impure air. It is a valuable colour in graining. *Burnt Sienna* is terra di Sienna burnt, an orange russet in colour; richer in colour, deeper, and more transparent, and works and dries better, than raw Sienna earth; and is permanent and very useful in oil and distemper work, and also in graining. 9.

SIENNA MARBLE; *Giallo di Siena*. A variegated yellow marble very similar to the GIALLO ANTICO of the ancients, in texture perfectly so. It is obtained from a place near Volterra. Its colour is variable, passing from cream yellow to an Indian yellow, traversed by white veins; and sometimes it forms a breccia with dark red or purple cement. A yellow marble veined with black, and a variety of white veined with grey are found near Siena. The latter was used in the public buildings of the city, and it is said for the cathedral at Florence. A limestone ridge near the Siena quarries furnishes a rose-red marble; BURNHAM, *Limestone and Marbles*, 8vo., Boston, U.S., 1883, p. 192. This marble was one of the first imitated in Scagliola. It has been greatly esteemed for slabs for console and other tables, inlay of chimney pieces, etc. The tomb 1579 to sir Thomas Gresham, in S. Helen's church, Bishopsgate, shows the use of it with black marble. A high dado at Brooks' bank at Manchester; and a chimney piece at their bank No. 81 Lombard Street, are good specimens of this now rather rare marble. A "Siena black marble of Como" is named, perhaps the "nero di Seravezza".

SIERAKOWSKY (count SEBASTIEN), of Poland, born 1770, died 1824. He published at his own expense before 1814 a work on Architecture in two folio volumes, the result of twelve years' labour; the plates represent not only the finest edifices in Rome, but it "embraces from the cottage to the palace, and from the cistern and ice-house to the aqueduct." ACKERMANN, *Repository of Arts*, etc., 8vo., London, 1814, xii, 163.

SIEVE. "Several sorts, some larger, others lesser, some finer, others coarser, to sift the lime and sand withal, before they wet it into mortar or lime and hair"; MOXON, *Mechanick Exercises* (Bricklayer), 4to., London, 1700, p. 14. Portland cement is now tested that no residue remains on a sieve of 655 meshes per square inch. The Metropolitan Board of Works require that 80 per cent. of the ground cement shall pass through a sieve of 5,800 meshes to the square inch. No. 50 mesh has 2,500, and No. 70 has 4,900. SCREEN.

The "Loughborough cinder sifter" is 1883 made in forms to suit every requirement, and can be used in the house.

SIGMA. The seat in a Roman COENACULUM or coenatio for seven persons; MARTIAL, lib. x, Ep. 48; and lib. xiv, Ep. 87. The *stibadium* was of a half-moon shape and held eight persons; while the *triclinium* held nine.

SIGNIA; the present SEGNI, in Southern Italy.

SIGNINUM; OPUS. A sort of beton, concrete, or mortar, so called from having been first used at the ancient Signia in Southern Italy. VITRUVIUS, viii, 7, describes its component parts for cisterns as of sand, lime, and flint. PARKER, *Walls of Rome*, 8vo., 1874, says it is the Ital. *coccio pesto*, and was made of broken brick or pottery and lime. It was used for aqueducts; and for floors to keep out moisture, as in the chambers of the Mamertine prison when it was partly rebuilt in the time of the emperor Tiberius (14-37). Pavements at Pompeii show its use

for floors, sometimes inlaid with pieces of white marble, and termed by PLINY barbarica or subtegulanea; Pompeii, 8vo., London, 1832, ii, 26; 182-5; 191; 201; 213. BURGESS, *Rome*, 8vo., 1831, i, 166, describes a specimen of the incrustation of Roman aqueducts as composed of opus signinum, opus spicatum, and opus musivum. GODWIN, *Concrete*, 1836, p. 6.

SIGNO or SEIGN. A town not far from SPALATO in Dalmatia; the former AEQUAM, a site not yet explored. 2.

SIGNORELLI (LEANDRO). A military architect of Perugia, born 1490, died 1530. 42.

SIGOVIA; see SEGOVIA, in Spain.

SIGUENZA (anc. Saguntia). A city in the province of Guadalajara, in Spain, and situated near the river Henares. On the top of the hill is the alcazar or castle, the only remains of Mohammedan architecture, occupied by the bishops, who were once lords of the city; and who raised the good aqueduct which supplies the town. The cathedral dedicated to S. Liberata, virgin and martyr, is complete in its dependent buildings. The church, or perhaps only the choir, was consecrated 19 June 1102; the first and second bishops were from Poitiers. The west front, nave, and aisles are XIII cent.; the rose window in the south transept is considered by STREET as one of the finest in Spain; he gives a portion of it. The great sacristy dates XIV cent.; the large chapel of Sta. Catalina, dedicated to S. Thomas of Canterbury by bishop Joceline of Wells (1206-42) who went over to Spain with queen Leonora, has many good marble tombs, 1485; 1522, etc. The *illeria* in the *coro* dates 1490; the *trascoro* 1685; the *retablo* 1613; the *parroquia* of S. Pedro, xv and xvi cent.; the cloisters finished 1507 and paved *cir.* 1750. STREET, *Gothic Arch. in Spain*, 8vo., London, 1865, p. 204-8, gives plan and interior view. It is 330 ft. long by 112 ft. wide. Of the three parish churches that of S. Vicente is Romanesque. The Geronimite colegio, *cir.* 1488, has a cloister of Roman architecture; the university founded 1441; and a court house in a very large colonnaded plaza with a fountain, are noticeable. 14. 28. 50. 66. 96.

SIKANDRA; see SECUNDA, in Hindostan.

SIKRA, or Vimana. *Sechara*. The tower or spire common to both Jaina and Hindu architecture in the north of India. It invariably surmounts the cells in which the images are placed. The *stupa* or tower, v or vi cent., at Buddh Gaya is the only Buddhist sikra yet discovered; that of the black pagoda at Kanaruc in Orissa is a typical example; from the vii cent. the style is complete and settled in all its parts. The *sikra* is surmounted by an *amalaka* and again by a flat dome on the centre of which is the *kullus* or pinnacle. FERGUSSON, *Indian and Eastern Architecture*, 8vo., London, 1876, p. 221-5. TOD, *Annals of Rajp.*, 4to., London, 1829, i, 516; ii, 709.

SILANIO. An architect mentioned by VITRUVIUS, vii, pref. s. 14, age and country uncertain, who wrote a treatise *On the Rules of Symmetry*.

SIL ATTICUM. A blue colour; see CAERULEUM.

SILE. Supposed to have been Attic ochre, the minium red lead. CUNEUS.

SILENUS. An architect, age and country uncertain, mentioned by VITRUVIUS, vii, pref., as having written *On the Proportions of the Doric Style*.

SILERIE; see CILIRIE. 4.

SILICA. SILICATISATION. Silicon combined with oxygen forms silicic acid, usually termed silica. One of the most abundant substances known. Quartz, sand, flint, chalcedony opal, and others, may be taken as examples of crystallized and uncrystallized silica. Under all these forms silica is capable of combining, through heat, with bases as an acid. Flint glass is a silicate of soda and lead. Insoluble glass is produced by the union of silica with more than one base. When combined with an alkaline base only, silica forms a soluble glass or "water glass", which may be prepared by various processes. Messrs. Ransome obtained it by dissolving broken flints in a solution of caustic alkali at a temperature of 300 deg. Fahr. This "water

glass" has been applied to several important purposes. I. To protect lime, and magnesian, building stones from decay. II. To render cements, mortars, etc., impermeable by water (PRESERVATION OF MATERIALS). III. The Stereochrome of Fuchs; the formation of an insoluble cement whenever the carbonic acid of the atmosphere acts on the substance, or whenever it is brought in contact with a lime salt. The origin of siliceous compositions for preserving stone is considered to be due to Fuchs, who in 1825 published a treatise on *Wasserglas* or soluble glass, which appears to have been used for protecting the surfaces of paintings against damp; for covering muslins and other fabrics to render them fireproof; by mixing it with sand and a little clay, for artificial stone; for coating stone by allowing it to penetrate to a certain depth. SILICEOUS PAINTING. WATER GLASS. KUHLMANN, *Mémoire sur l'intervention de la potasse ou de la soude dans la formation des chaux hydrauliques*, 1841. *Expériences chimiques et agronomiques*. BARLOW, *On Silica*, etc., read at Royal Inst. of Great Britain, *Proceedings*, 1854, i; CIVIL ENGINEER, etc., *Journal*, xvii, 382. *Water Glass and its Application*, in *Builder Journal*, 1857, xv, 709. DELEMAGNE, *La Silicatisation appliquée à la conservation des Monuments*. *Reclamation de priorité d'application*, 1867 (?), referring to work 1861-3; *BUILDING NEWS Journal*, 1867, xiv, 499.

SILICATE COTTON; see SLAG WOOL.

SILICATED and Siliceous STONE PAVING. *Ransome's* patent. From 1878 it was manufactured by machinery, of uniform texture, and does not become slippery; it is cheaper than York stone. It is useful for halls, coachhouses, etc.; and was laid in Oxford street, at Greenwich, and elsewhere.

SILICATE PAINT. A new material, the basis of which is said to be a deposit in North Wales, of almost pure silica; to be a good substitute for white lead being non-poisonous; to resist the effects of heat; and of damp as a waterproofing solution; and surpassing the present paints in body, density, colour, and durability. A company was started 1881, J. B. Orr and Co., patentees or proprietors. *BUILDING NEWS Journal*, 1872, xxiii, 344.

SILICEOUS BRECCIA, also called Egyptian, and Universal breccia, and pietra fructiculosa. A conglomerate or pudding stone, composed of round yellow and red pebbles mixed with dendrites. Also a very hard and rare breccia containing porphyry and granite of all colours, particularly green, yellow, and red. The quarries of Breccia verde, from which so many objects were cut by the ancients both in Pharaonist and Roman times, are still to be traced in the road from the hill to Kossayr. The present condition of the locality is described by WILKINSON, *Handbook*, 12mo., London, 1847, p. 399.

SILICEOUS PAINTING, by silicates of soda and potash. Cantor Lecture at Society of Arts, by F. S. Barff, *Artists' Colours and Pigments*, 1870; *BUILDING NEWS Journal*, xix, 472; 1873, xxv, 665. SILICA. STEREOCHROME.

SILICEOUS PASTE OR CEMENT. A solution of silica as manufactured by Messrs. Ransome; it is described in the patent 1844-5 for the manufacture of artificial stone; CIVIL ENGINEER, etc., *Journal*, 1844, viii, 169; and described *idem*, 1848, xi, 61. RANSOME'S INDURATING PROCESS.

SILICEOUS SCHIST; see FLINTY SLATE.

SILICEOUS STONE; see SANDSTONE; SILICATED STONE.

SILK HALL or MARKET. The halle aux soies, at Valencia, in Spain, a curious mixture of Moorish and Gothic architecture, in MOYEN AGE MONUMENTALE, fol., Paris, pl. 200. GUENEBAUT, *Dict. Icon.*, 8vo., Paris, 1843, ii, 38.

A building for rearing silkworms (Ger. *seidenbauhaus*), at Villemonble near Paris, for M. Grimaudet, designed by Destailleurs, is given in ALLGEMEINE BAUZEITUNG, 1836, pl. 95. ARCET, in JOURNAL DES CONN. USELLES, etc., for March 1836.

SILK MILL; BRANDE, *Dictionary of Science*, etc., 3rd edit., 1853.

SILL, sole, and soyle, formerly written scill and now CILL (Angl. Sax. *selle*; Lat. *solum*, threshold; Fr. *seuille*; Ital. *limestone*; Ger. *schnelle*; *Fensterbrüstung*). The horizontal timber

ARCH. PUB. SOC.

base of a door or window frame. Also the stone base on which the frame rests, which is therefore called the sill of the window or window-sill. It is generally of Yorkshire or Portland stone, 8 ins. by 9 ins. by 3 ins. or more thick; and plain, weathered, or sunk, and throated. 24 Henry VIII, Soyles and jawmes of two greate wyndowes; BAYLEY, *Tower of London*, 4to., London, 1824-5, i, App., xvii. A double window-sill, at the church of S. Mary and All Saints, Swarby, Lincolnshire, as also in several other churches in that district, is contrived by the lower part of the window being filled in with panelling.

The solid frame of a door is let into a stone, as in basements, which is also called a sill. GROUND SILL. The lower horizontal part of a framed partition is also called the sill; the upper one being the "head".

The patent weather-tight SILL BAR, to prevent water being blown under the casement into the room, is given s. v. French Casement; and in ENCYCLOPEDIA BRITANNICA, 9th edition, s. v. Building, which also shows an old French window-sill. *BUILDER Journal*, 1844, ii, 208-9.

1. 16. 19.

SILLERO (ANTONIO), 1560-5, master of the royal works temp. Carlos V, at the monastery of the descalzas monks (Carmelites) at Madrid. DIEGO, probably his son, 1605 succeeded A. de Segura as builder of the alcazar at Madrid, of the palace el Pardo, and of the house of Campo, at the salary of 350 ducats per annum, under F. de Mora.

66.

SILLUSTANI. On a promontory in the lake Umayo, in Peru, are several very fine *chulpas*; one of the best is 16 ft. diameter at the base and 39 ft. high; widening as it rises to 34 ins. greater diameter. It is formed of a hard compact basalt; a number were also built of rough stones and cemented over. There are also many stone circles and semicircles of varying diameter, defined by a platform; one is 124 ft. diam.; another about 90 ft. LEWIS, *Architecture*, in ENCYC. BRIT., 9th edit., p. 451, from SQUIER, *Peru*; *Incidents*, etc., 8vo., London, 1877, p. 376-89.

SILLO. VITRUVIUS, vi, 8, states that those who have to store the produce of the country under their houses should have vaults (*cryptæ*), granaries (*horrea*), store rooms (*apothecæ*), and other apartments suited rather to preserve such produce than to exhibit a magnificent appearance. Such a store place is now of two sorts, one for grain (GRANARY), and the other an airtight construction formed in the ground for conserving green crops for "ensilage". The TIMES Newspaper for Saturday, 21 October 1882, p. 9. *BUILDER Journal*, 20 Jan. 1883, xlv, 95, 195, 897. NEVILE, *Farms and Farming*, 8vo., 1884, part 3 and a design for a silo. *The Construction of Silos and the Compression of Silage*, in the BUILDING WORLD Journal for Feb. and June 1885, with illustrations. Report on Ensilage, etc., by the Royal Agricultural Society, 1885. ROBINSON, *Some recent Phases of the Sewage Question*, in SURVEYORS' INSTITUTION, *Transactions*, xvii, 220, etc.

A silo for fruit, formed in a pit covered with oak planks and 4 ft. of earth, is shown in LA PROPRIÉTÉ Journal, 4to., Paris, 1834, pl. xx.

SILLOE (DIEGO DE), born about 1480 at Burgos, son of maestro GIL DE SILOE who executed 1489-93 the fine alabaster tombs of Juan II and Isabella and their son Alonzo, at Miraflores near that city. Diego was also a pupil of Simon of Cologne (died 1512). Cir. 1510 he was deputed with A. de Covarrubias to report on the capella mayor at the cathedral at Plasencia, begun 1498 by J. de Alava. 1519-52 designed the royal monastery and magnificent church of La Concepción of S. Geronimo, at Granada (now cavalry barracks and dilapidated), which contains the tomb of Gonsalvo Fernando of Cordova, the great captain, died 1515; CIVIL ENGINEER, etc., *Journal*, 1841, iv, 165. The cloister of the former Hieronymite monastery at Granada is attributed to him and shows the transition in style which occurred 1496-1519. The cathedral at Malaga is attributed to him, begun June 1522, but altered after 1563 by D. de Vergara. As maestro mayor he designed, partly after his father's plans,

Y

the cathedral (with Corinthian columns inside) at Granada, begun 15 March 1529, consecrated 17 August 1560, and continued on his death by the *aparejador* J. de Maeda, and others. 1530 he was called to Toledo to design the capilla de los reyes in the cathedral for Charles V, which is also attributed to Covarrubias. 1530-35 he reported on the designs of D. de Riancho for the chapter house and the two sacristies at Seville cathedral, which he approved and inspected occasionally; they were each carried out in a different style by M. de Gaenza. 1552 he also designed at Granada the royal hospital of S. Juan de Dios; the noble façade to the monastery of Santo Domingo, now the museo; with other edifices in that city; where he died 1563. In his long will (given in LLAGUNA) he appointed J. de Maeda his executor and heir to all the drawings and to part of his armour; and to his son A. de Maeda he left all his tools and instruments. 3. 28. 65. 66. 68.

SILOUR; SLOURING; see SEEING.

SILPL. The Hindoo name for architect, practising "silpa sastra" or architecture or building. TOD, *Rajasthan*, 4to., London, 1829, ii, 709; 748.

SILSILEH; GEBEL (Gr. *Silsilis*). The sandstone quarries on the east and west banks of the river Nile, near Edfoo, largely used at the temples at Karnak and Luxor, Goornah, Medinet Haboot, Esneh, Edfoo, and Hermonthis. Those on the east bank are remarkable for their extent; a cutting about 10 ft. wide, 400 ft. long, and from 40 ft. to 50 ft. in height, smooth and clean cut, rich amber in colour, leads to a large area, beyond which is a smaller one; the chisel marks of 2,000 years since are perfect. There is still the inclined plane down to the river; the blocks best in grain and colour were taken out square, the others left, sometimes projecting. The quarries on the west bank are noticeable for the many caves made out of the excavations, and the inscriptions, described in the *Handbook*. DESCRIPTION DE L'EGYPTE, i, pl. 47. RAMÉE, *Hist. Gén. de l'Arch.*, 8vo., Paris, 1843, i, 222. EDWARDS, *Up the Nile*, 8vo., London, 1877, ii, 583. EGYPTIAN ARCHITECTURE (p. 22). 28.

SILT. The alluvial soil washed down and deposited upon the bottoms and sides of rivers; any soft light description of soil; mud or slime, or earthy sand on a river or sea-shore. ROOKE, *Action of Silt and Shingle*, in CIVIL ENGINEER, ETC., *Journal*, 1845, viii, 309. LIDDELL, *Building on a Clayey or Silty Foundation*, in *BUILDER Journal*, 1845, iii, 517; 546. GRAVEL SAND. SLEETCH.

SILVA (CARLO FRANCESCO), born 1661 at Morbio di Sotto, was educated at Rome where he executed some sculpture, but devoting himself to architecture, he designed at Como the church of S. Euphemia, and the façade to that of Gesù Cristo; at Marignano, a (kunstliche) bridge; and a church in his native place at his own expense. He died 1726 at Milan. 68.

SILVA (FELIX JOSÉ DA COSTA E); see COSTA E SILVA (F. J. DA).

SILVANI (GHERARDO), also a sculptor, was born 13 Dec. 1579 at Florence, became a pupil of G. Caccini, Valerio Cioli, and B. T. Buontalenti. As only a few dates can be put to his works, they are arranged as follows. He designed 1601-15 or modernised with G. Caccini the capella de' Pucci or S. Bastiano, in the church of Sta. Maria dell' Annunziata; designed 1611 the external portico to the church of Madonna de' Ricci; carried out the side chapels and interior of the church of Sta. Maria maggiore after the designs of B. T. Buontalenti; 1612 rebuilt the large chapel of S. Pietro maggiore; before 1613 enlarged and decorated with L. Cardì (Cigoli) the pal. Guicciardini, with its great staircase and chapel; also the pal. Rinuccini; 1626-32 modernised the pal. del Luca degli Albizzi; 1626 or later, designed the church of S. Carlo de' Barnabiti; 1628 the pal. and casino for the marquis Salviati, via detta in Pinti; 1630 *cir.* the cloister of the sacristy of Sta. Maria degli Angeli; (RUGGIERI, ii, pl. 76-7, gives a door and window of the church); modernised or completed the casino Mediceo or di S. Marco, via Larga, for the cardinal Medici (altered by B. T. Buontalenti and now cavalry barracks); 1630 restored the church of SS. Simone e Guida; 1632 the church of the compagnia delle Stimate;

1634 designed the pal. Castelli, Marucelli, and Brunaccini, now Fenzi, via S. Gallo; 1636 was appointed (after the death of G. Parigi) "architetto dell' opera" at the cathedral of Sta. Maria del Fiore (for which he *cir.* 1590 had designed a façade of two orders, not accepted), carrying out repairs and works for strengthening it; 1638 designed the casino G. and C. Riccardi, now de' Stiozzi-Ridolfi, via Gualfonda; 1640 continued the church of SS. Agostino e Cristiana after the death of B. Radi; after 1649 (the death of M. Nigetti) he designed the façade (RUGGIERI, iii, pl. 52-8) of three stories to the pal. J. B. Strozzi, principe di Forano, near Sta. Trinità; and continued the rebuilding of SS. Michele e Gaetano (or S. Michele Bertelde or degli Antinori) belonging to the Theatines (FAMIN, pl. 65); 1650 *cir.* the pal. marq. Vin. Capponi now Covoni, via Larga (cortile by L. Orlandi); 1670 *cir.*, at the church of S. Frediano, modernised the buildings and designed the second cloister; 1675 the conservatorio delle Quete with a church; and at Pistoia, 1670 *cir.*, he completed the greater part of the pal. Sapienza or college.

He also designed the church of S. Francesco di Prato outside Florence; the pal. Strozzi now Gianconi; the pal. Coppoli and Medici now Bartolommei, via Larga; the pal. Bardinella in contea di Verbellezza; the casa Remedioti for the Bartorelli; the villa Guadagni now della Falle; modernised with a new façade the pal. Gianfigliazzi and Fontebuoni then Buonaparte, later casino de' Nobile in Lungarno (enlarged 1841 by B. Silvestri); the pal. Guadagni now Riccardi, piazza del Duomo; the pal. del S. L. Peruzzi, borgo de' Greci; the pal. Guadagni now Velluti-Zati, via S. Sebastiano (occupied by Charles Edward Stuart); altered the pal. Acciajoli now Corsini, via del Prato (by B. T. Buontalenti); finished the casa for the prior Seb. Ximenes now Panciatichi (begun 1490 by G. Giamberti da S. Gallo, died 1517); and designed the lavatoi pubblici delle Arti della Lana e Seta. The pal. Gerini, via del Cocomero (RUGGIERI, iii, pl. 76) was probably by him; and he made *cir.* 1612 a design for enlarging the pal. Pitti; and another for the pal. of Poggio imperiale; and 1635 for a bridge at Pisa (see BARTOLOTTI), his design of three arches being carried out 1644 by F. Nave of Rome. He died 23rd November 1675.

Other works mentioned by BALDINUCCI (some perhaps under above names), are the new pal. in podestat de Montale; oratory commenced by his master Caccini; convent of Sta. Maria dei' Angeli; casa of chev. del Rosso; casa of J. A. del Rosso; fine saloon in the pal. Galli, via del Pandolfini; another in pal. Pucci; he modernised the pal. conte Alberto di Bardi; restored, etc., the Salviati chapel in church of Sta. Croce; designed the villa of sen. Ugolini à S. Martino à Strada; that of Giucciardini à Valdipesa; that of Giu. Morelli with houses in Florence; villa for L. Altoviti à Romituzzo; villa of Lor. Strozzi à Valdipesa; and at Volterra completed the pal. for the admiral Inghirami. FANTOZZI, *Firenze Disegnata*, 4to., Flor. 1846, and *Guida di F.*, 8vo., 1842. QUATREMÈRE, *Vies*, 8vo., Paris, 1830, ii, 376. RUGGIERI, *Studio d'Architettura*, fol., Fir., 1722-8. FAMIN ET GRANDJEAN, *Arch. Toscane*, fol., Paris, 1846; new edit. 1875. 3. 12. 25. 32. 33. 68.

SILVANI (PIERO FRANCESCO), born 1620, was a son and pupil of GHERARDO, and much employed at the cathedral at Florence; in which city 1645 May 28 he designed the church of the padri dell' Oratorio di S. Filippo Neri; of which portions were by A. Ferri, F. Ruggieri, and Z. del Rosso; 1645-51 altered with his father and M. Nigetti the chapels of the principal limb of the cross in the church of Sta. Maria Annunziata of the Servites (designed 1448 by M. Michelozzi); 1648 façade to the church of SS. Michele e Gaetano (or S. Michele Bertelde); (ZOCCHI, pl. 11; and plan in FAMIN, pl. 65); 1650 modernised the interior of the church of S. Marco; 1656 at the palazzo di S. Andrea Corsini in Lungarno, the stairs to it and the chapel; 1675-83 the capella di S. Andrea Corsini in the church of Sta. Maria del Carmine; also enlarged the palazzi Rucellai Alberti now Stiozzi-Ridolfi; and enlarged pal. Rinuccini (by L. Cardì da Cigoli) by the addition of the pal. Pecori to it; and commenced

the pal. Naldini, finished 1726 by P. Giannozzi. He died 22 June 1685 aged 64. 3. 30. 32. 68.

SILVER GILT PLATE; formerly called PARCEL GILT.

SILVERTON STONE. Obtained from quarries in Devonshire was used in the vaulting at Exeter cathedral; and in some parts of Westminster abbey. BRITTON, *Exeter Cathedral*, 4to., London, 1827, p. 89, 94. BUILDER *Journal*, 1860, xviii, 47. The Pakeham quarry is now much used for stone at Exeter.

SIMA. "Above the coronæ the simæ, which the Greeks call ἐπιρῖθδας are to be made", etc.; VITRUVIUS, iii, 5. It is probably the molding now called CYMA recta or ogee. EPICRANITIS. In INWOOD, *Erectheion*, fol., London, 1827, p. 138, pl. 26, the decoration of the sima is cut in a straight line between being at a right angle with the slope and being perpendicular.

SIMMONING. "Glaserye: the best French glasse wrought with good lead, well simmoned, is worth 16d. a foot. The best English glass wrought with an arch well leaded and simmoned at 7d. a foot. Ordinary glass for quarries at 5½d. a foot;" GERBIER, *Counsel, etc., to Builders*, 12mo., London, 1663, p. 83. "Simoning; the rubbing of the pane all over with burnt alabaster and oil mixed, that the Joynts may keep out rain and other kinds of foul weather"; HOLME, *Academy of Armory*, fol., Chester, 1688, p. 385. Simoning brush or rubber; see GLAZIER.

SIMMONS (RODOLPH); see SIMONS (R.). Also SYMMONS.

SIMON LE MASOIN; magister; 1332 is the first master mason recorded in the Fabric Rolls of York cathedral. MASOIN.

SIMON; see BECHERER.

SIMON, son of Johann of Cologne, better known as Juan de Colonia; see BURGOS and COLOGNE.

SIMON DU MANS, is supposed to have been one of the chief assistants of Etienne de Mortagne in the construction of Tours cathedral; perhaps succeeding him. He is named in a charter of 19 Oct. 1279. LANCE, *Dict. Biog.*, 1872.

SIMONE; see POLLAIUOLO (S.).

SIMONE (SAN); see SANSIMONE.

SIMONET and SIMONNET (le sieur), juré expert, member of the academy of architecture at Paris, was born 1735. (After 1732) altered the hôtel de la Vrillière forming great part of the hôtel de Conty (by A. Guilloit) in the rue S. Dominique at Paris, for S.A.S. Louise Elizabeth de Bourbon Condé, princesse Douairière de Conty. BLONDEL, *Arch. Franç.*, fol., Paris, 1752, i, 238. He died 1742. LANCE, *Dict. Biog.*, 1872.

SIMONETTA, near Milan; see ECHO.

SIMONETTI (MICHEL ANGELO), designed the palace at Barby for the elector of Brandenburg, completed after 1720 by J. H. Broebes. For pope Clement XII (1730-40) he designed the hall of the Greek cross at the museum of the Vatican at Rome; and for pope Pius VI (1774-1800) the rotunda, 50 ft. diam., completed 1790 by P. Camporesi. ROSSINI, *Monuments*, fol., Rome (1818), pl. 9.

SIMONS or SYMONS (RUDOLPH), not Symonds or Simmons. He designed 1584 the first portion of Emmanuel college, Cambridge, for sir Walter Mildmay, in which college is his portrait without date, being the head with hands holding a large pair of compasses, with a long inscription given in BLOMEFIELD, *Collect. Cantab.*, 4to., Norwich, 1750, p. 116; and in WALPOLE, *Anecdotes*, 8vo., edit. 1862, i, 195. This picture was exhibited in the National Portrait Exhibition 1866 as "Simon the architect, painter unknown". He also designed Sidney Sussex college adjoining, 20 May 1596-8 for the executors of lady Frances Sidney, countess of Suffolk; and rebuilt great part of Trinity college and adding the north and south sides of Neville's court, both for Thomas Neville, master 1593-1615. The original plans of the "central" or second court built 1599, of S. John's college, signed by Ralph Symons, were shown by prof. Willis at the Architectural Congress at Cambridge, 1860. He may also have designed *cir.* 1580 Apethorpe hall, Northamptonshire, for sir Walter Mildmay (died 1589 and buried in the church of S. Bartholomew, Smithfield), now belonging to lord Westmoreland. NEALE, *Seats*, etc., 4to., 1826, iii. 19.

SIMPLICITY. "A supreme excellence in all the perform-

ances of art, because by this quality they more nearly resemble the productions of nature"; *The World*, No. 26, June 28, 1753. BLONDEL, *Cours d'Arch.*, 8vo., Paris, 1771, i, 396-7. *On Simplicity of Composition, especially in Churches of the Early English Style*, in *ECCLESIOLOGIST Journal*, 1843, ii, 119. RICHNESS. 11. 25.

SIMPSON (ARCHIBALD), born 1790 at Aberdeen, apprenticed to Mr. Massie, builder, and studied for a short time with R. Lugar of London. He visited Italy and consulted the best writers on art. Among his chief works in Aberdeen are:—1817 S. Andrew's chapel; 1818 medical society hall; 1819-20 lunatic asylum, since greatly enlarged; 1820 the county buildings (Greek), (now 1877 the music-hall buildings); 1836-8 the Established East church (Decorated); 1837-41 Marischall college (Gothic); view in ILLUSTRATED LONDON NEWS, 1st Oct. 1859; 1838-40 royal infirmary (Italian); 1841-2 the large market; 1842 North of Scotland bank (Classic); 1843 orphan asylum in Albyn place; 1844-5 the group of three Free churches in Belmont street (one burnt 1874); 1846 mechanics' hall; the public rooms; Market street from the quays into the city; old post office; athenæum; town and county bank, now Scottish Provincial assurance company; Northern assurance office; Oldmachar Free church; Bell's schools; Frederick Street, etc.; he also planned Bon-accord square and terrace; and Ferryhill.

At Elgin, the Established church (Grecian); the Anderson institution (Grecian); at Huntly, the duchess of Gordon's schools, and rebuilt part of Gordon castle, with its chapel. He designed and carried out wholly or in part, the mansion houses of Boath and Glenferness, in Morayshire; Newe, Murtle, Meldrum, Heathcote, Park, Durris, Druminnor, Putachie, Crimonmogate, Scotstown, Haddo, Lessendrum, Thainston, Carnousie, Craig, Pittodrie, and Tullos, in Aberdeenshire; Stracathro and Letham, in Forfarshire; and the bridge across the Spey at Fochabers. He had planned the Free church at Rothesay, the additions to Skene house; and at his death the railway station. His portrait was painted by James Giles, R.S.A. The late T. Mackenzie was a pupil. He died 23 March 1847, aged 56. RAMSAY, in ABERDEEN JOURNAL; and BUILDER *Journal*, v, 217. ARCHITECT *Journal*, 1877, xviii, 60, giving dates and cost. GENTLEMAN'S MAGAZINE, xxvii, New Ser., 665.

SIMPSON (JOHN), designed the general hospital at Notting-ham of which the first stone was laid 12 Feb. 1781. The south-east prospect was engraved by J. Newton, large folio.

SINAN (KHOUEH, or KOJA, ABDULLAH), pasha, the most celebrated Ottoman architect, who is said to have "built 3060 buildings, consisting of khans, mosques, imarets, colleges, schools, palaces, etc.; the round cupola, entirely of marble, for his own monument near the mosque of Suleiman, in the corner of the palace of the agha of the Janissaries, adjoining the Fountain house, all at Constantinople; he died 170 years old" (?), as stated in EVELIYA, *Narrative of Travels in xviii cent.*, transl. by J. von HAMMER for Oriental Translation Fund, 3 parts, 4to., London, 1834-50, (Eveliyya was born 1611 and died about 1679). The three chief works by Sinan are 1521-7 the mosque of sultan Selim I (1512-20), the dome of which is a span larger than that of Aya Sofia, but not so high; 1543-50 (or 1550-5) the mosque of sultan Suleiman I (1520-66) of local ancient materials and marbles brought from Egypt: the dome is the same as that of Aya Sofia and 21 ft. higher; the aqueduct of 3,700 arches for the forty fountains, for Suleiman; 1548-58 the mosque by Suleiman for his favourite son prince Muhammad; and the mosque of sultana Valideh, built for the mother of sultan Murad III. These and other buildings are named or described in pt. i, p. 69, 73, 75, 81-3, 167-8-9, 170-3, palaces 176, caravanserais 177; pt. ii, p. 18-9, 31-3-7-9, 41-4, 51-2-9, 65, 75-9, 80-1-4; pt. iii, p. 91: (i, 4, 14, 63, and ii, 63, may refer to other Sinans).

In pt. iii, p. 90, it is mentioned that his first assistant HASSAM showed his skill in the large (the largest of the three) mosque of Mustafa pasha at Gebizé, on road to Erzeroom.

The mosque of Perten-pacha at Nicomedia, is attributed to a SINAM who flourished about 1220, by TEXIER, *Asie Mineure*, fol., Paris, 1839-49, i, 184.

SINANO. The modern name of MEGALOPOLIS, in Arcadia. SINGCRESTE and Sencreste. A crest of some peculiar form, as named in the Accounts of S. Stephen's chapel, Westminster. 19.

SING-CHING or Kwangchau-fou. The native names for CANTON, in China.

SINGER'S CEMENT; see RESINOUS CEMENT.

SINGING HALL; see MUSIC HALL. A timber building, about 300 ft. long by 200 ft. wide, was erected 1852 at Düsseldorf for the societies and audience. MUSIC ROOM.

SINGLE FRAMED ROOF. A roof with trussed rafters. Sometimes they have only diagonal braces connecting the rafters; these generally occur where the span is small. In wider spans, even without tie-beams, each pair of rafters was framed with a collar beam, and was stiffened by braces crossing at times above the collar, and at others the braces being tenoned into its under side: when the latter was the case, a second collar was generally introduced above the first. Such roofs were very frequently boarded underneath, forming a polygonal barrel vault, and with ribs and bosses. 1.

SINGLE FRAME; SINGLE JOIST, and NAKED or SINGLE FLOOR. A floor with only one tier of joists, i.e., one without binding joists.

SINGLE HUNG. In a pair of window sashes where only the bottom or the top are movable or hung.

SINGLE MEASURE. When applied to doors means square on both sides; "double measure" is moulded on both sides; "measure and a half" is moulded on one side and square on the other. 1.

SINGLE SPAN CHURCH. A church with a very wide nave, or a roof from wall to wall. The BUILDER *Journal*, 1867, xxv, 511, 661, 700, and 716. GWILT, *Encyc.*, 1876, p. 241, gives plan and section of the church of the Dominicans at Ghent, 1240-75. FERGUSSON, *History of Arch.*, 8vo, 1865. *Wide Nave Churches*, in BUILDING NEWS *Journal*, 1871, xxi, 309. SCOTT, *Lectures*, 1879, ii, 104, 114, etc. NAVE. Many of the plans of the churches in the city of London designed by sir C. Wren are so arranged. 1.

SINGLE SLATE. A small slate; it is less than a "double" which runs from 13 ins. by 10 ins. to 11 ins. by 5½ ins. A thousand (1,200) "singles" cover about one square. 1.

SINGLETON (LUKE), a private gentleman, designed 1755 the general infirmary at Gloucester, generally copied in others of the period, as by H. Keene for the Radcliff infirmary at Oxford.

SING-SING GRANITE; see QUINCY GRANITE.

SINGAGLIA (anc. Sena Gallica). A town near Ancona in Central Italy, at the mouth of the river Misa. The bishop's see was founded in iv cent. The fortifications date about 1555; a plan and view of the fortress is given in *Illustrations*, 1863-5, pt. 1 (pl. 142). The cathedral is dedicated to S. Pietro (Italian); the chapel of the Virgin therein by G. Ferroni, disciple of P. Ghinelli of Siena. The church *cir.* 1780 and casa of the Jesuits; and the palazzo dell' abate Farsetti, a Venetian, in his villa di Sala, are both by P. Posi. The church of Sta. Maria delle Grazie, 1490, is by B. Pontelli or Pintelli (perhaps completed by G. Genga of Urbino). The churches of S. Martino and Sta. Croce are also named. The bishop's palace, *cir.* 1540; and the monastery of the Zoccolanti on Monte Barrochio are by G. Genga. CIMARELLI, *Di S. sito, edificazione, e progressi, nella sua Umbria Senonia*, 4to, Brescia, 1642. Grille, in *Illustrations*, 1858-9 (pl. 163). 12. 28. 50. 96.

SINK (Scot. JAWSTONE). Formerly a drain for carrying off foul water (SCOURER of synks); but now more generally applied to a shallow stone trough, used for household purposes, supported on brick piers at a convenient height. The foul water is carried through a hole covered by a grated bell trap let into a

pipe and into a drain; this grating is now usually soldered down, and then a pipe having a syphon with screw boss for cleansing is discharged if possible onto an outside grating, leading to the drain. Many varieties are now made; as the lead-lined wood frame for a butler's pantry; the stoneware sink highly glazed; the porcelain lined sink; the enamelled fire-clay sink; the enamelled iron, or galvanised iron sink, having a slot in a partition at the side through which the foul water escapes; and the slate sink. There are also the sinks used in Laboratories as described by ROBINS, *Fittings for Applied Science Instruction Buildings*, read at ROY. INST. OF BRIT. ARCHITECTS, 1883-4.

SINK. In a Roman Catholic church; to receive the water used in cleansing the chalice. A sink in the sacristy at Cologne cathedral is perhaps a rare example. PISCINA.

SINKING. A water table. A stone window sill is worked sloping from the wood sill to the outer edge to let the water flow off (Fr. *rejet eau*; *gravure*). Any work executed beneath the general surface of the material is said to be sunk, as of a groove, Fr. *entaille*.

SINKING of a foundation or wall; see SETTLEMENT.

SINK TRAP. A patent syphon trap immediately under the sink formed with the grating, and with a cap at the side for cleaning it out. An American patent sink trap has a grease trap and syphon cast with the iron sink, the grating being so large as to admit the hand for cleaning out the dirt. Deposits in pipes and drains have proved a source of annoyance, which has produced the "grease trap" or "interceptor" for retaining both, and so preventing their flowing into the drain; it should be placed as far from the sink as possible, otherwise very hot water will melt and carry the grease through into the drain. BELL TRAP.

SINK TRAP or deposit reservoir, also called sludge pit, sand check, catchpit, and cesspool. One for the purification of water from sediment is figured (9) in *Detached Essay Aqueeduct*, and s. v. PISCINA. A trap formed at certain intervals along a line of drain or sewer, where refuse would be deposited and be cleared out by means of a manhole. Such a trap about 8 ft. by 6 ft. by 5 ft. deep was formed at Glasnevin cemetery; and at the dock sewer at Liverpool before 1854.

SINNAMAR. Arab architect; see SENNAMAR.

SINNILLACIO. Perhaps the same as SCAPULATIO.

SINOPER and SINOPE. An old word in England for a brownish colour like ruddle. CINNABAR. In heraldry it denotes vert or green colour and obtained from the Levant.

SINOPI. An earth of a beautiful red colour, brought from the city of Sinope in Pontus, and used for the red grounds in the paintings at Pompeii and elsewhere. It was of three shades; the red, middle, and the less red. The best quality came from Lemnos, the Balearic isles, Cappadocia, and from Egypt. An inferior sort from Africa was called "cicerculum"; Pompeii in Library of Useful Knowledge, 8vo, London, 1832, ii, 56; 119. OSTRUM.

SIN-SIN. A town situated between Koum and Kashan, in Persia. Lanker-rood, a deserted town, consisting of nearly a hundred large insulated structures, each constructed of several central arches supporting a pointed dome, and cells around; old walls and towers. Dhay-nain, another deserted town of similar description. Caravansary of Sin-Sin, a spacious building erected by Futteh Ali, shah of Persia (1796-1834); there are similar structures proving them to have been general in this part of the country at the time these towns were of consequence. PORTER, *Travels in Georgia, etc.*, 1817-20, 4to., London, 1821, i, 380-5.

SINTO TEMPLE; see SHINTOO.

SINT TROND, or de Sancte Trudone (GERHARD VON); see KETTWIG (G. VON).

SION; monastery of; see ATENI.

SION (Anc. *Sodunum*; Ger. *Sitten*). The capital of the canton Valais in Switzerland, near the river Rhone, having the torrent Sionne running along the principal street. The ruined castle, called Tourbillon, built 1294 (? 1492) on the summit of a steep rock, was until 1788 the residence of the bishop; and on

another rock is the castle Valeria, containing a catholic seminary, with the cathedral of S. Catherine, Romanesque and Early pointed; the rood-loft of XIII cent. is perfect; BLAVIGNAC, *Histoire d'Architecture Sacrée du IV^e au X^e siècle*, 8vo. and fol., Laus., 1853; the organ case in the church is probably the oldest in Europe; it is given in HILL, *Organ Cases, etc.*, fol., London, 1883. The third and episcopal castle, called Majoria, was rendered uninhabitable 1788 by a fire which destroyed great part of the town. The new cathedral is dedicated to the Assumption of the Virgin; the bishop's palace adjoins. The town-house is a fine specimen of pure Gothic. SAZERAC, *Lettres sur la Suisse*, fol., Paris, 1823-32; pt. iv, p. 71, pl. 19, 20. "The elegant church of S. Theodule" is named by BAEDEKER, 1864. The abbey of S. Maurice, and the lower cathedral, and the church of All Saints, are referred to by FREEMAN, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1863-4, p. 181-95. 28. 50. 96.

SIOUT, Osioot, and Asyoot (Gr. *Lycopolis*; Copt. *Sîout*). The capital of Middle Egypt, near the left bank of the river Nile. The sand cliffs near are perforated with successive tiers of innumerable tombs of XIII and other dynasties. Several good bazaars, and mosques, one of which has a lofty minaret; the public baths dating in an early period of the Arab conquest, which have the central dome supported by antique granite pillars with a white marble fountain in the centre, and marble pavements, are noticeable. SONNINI, *Upper and Lower Egypt*, 8vo., 1807. *Description de l'Égypte*, iv, pl. 4, 63-7. FORBIN, *Voyage dans le Levant*, 1817-18, fol., Paris, 1819, p. 57. AMPÈRE, *Voyage en Égypte et en Nubie*, 8vo., Paris, 1868. The ARCHITECT *Journal*, 1885, xxxiv, 70, relates the recent discovery of a supposed mediæval secret laboratory under the Arab cemetery. 23. 28. 50.

SIPARIUM. The Latin term for a curtain, which was often used instead of a door to a room. In temples it concealed the image of the deity when sacrifice was not performing. It was also raised before the tribunal of the judges in criminal causes to admit of their discussing the subject with greater secrecy. AULÆA. 2. 78.

SIPHON; usually written SYPHON.

SIPHONIA ELASTICA (Hevea of AUBLET). A Brazilian tree, which attains a height of 60 or 70 ft. with a stem about 3 ft. diameter at the base, and clear of branches for 40 or 50 ft. It affords the gum-elastic CAOUTCHOUC or india-rubber, as does also the *Ficus elastica* and other plants.

SIPONTUM. Near the modern MANFREDONIA, in Apulia.

SIRACUSE; see SYRACUSE.

SIREN. A female figure sometimes represented draped, with wings and bird's legs. "The syrens three" alluring Ulysses, are represented on an Etruscan urn discovered 1770 now in the Uffizi museum at Florence. MICALI, *Mon. Ined.*, 256, considers they are symbols of the soul. On an amphora from Vulci in the British museum is a representation of a male and of a female siren. DENNIS, *Etruria*, 8vo., London, 1848, i, 127, 434; ii, 96, 382, and 443 on a fine bronze lamp in the museum at Cortona. HARPY.

SIRENA STONE. The *pietra Serena* of Florence; also called MACIGNO STONE. It is contemporaneous, according to MURCHISON, with the eocene or older tertiary strata of Northern Europe, and is obtained at Arezzo, Cortona, and Volterra; that at Fiesole being considered the best was chiefly used for building at Florence, where the paving-stone is from Campora in the mountains of Macigno. 28.

SIRINAGUR; see SHRINAGAR, the capital of Kashmir.

SIRTORI (GUARNEIO DA) is mentioned as employed on the works at Milan cathedral from 20 March 1388 to 14 Sept. 1399; GIULINI, *Memorie*, 4to., Milan, 1760-71, xi, 450; and FRANCHETTI, *Storia del Duomo*, 4to., Milan, 1821: who also records MASSIMINO DA S., as engaged 23 January 1401: ERASMO DA S., 1402 called ingegnerius et magister a lignamine: LEONARDO DA S., 16 Dec. 1403 also so called: DONATO DA S., 25 Nov. 1448: and

ARCH. PUB. SOC.

SIMONE DA S., from 27 June 1490 to 1503; in a book of 1491 he is called "presbiter S. de S. ingeniarius fabrica".

SISSEVERNE (....., perhaps GILBERT), prior of Redburn, was entrusted by John de Cella and William de Trumpyngtone, abbots of S. Alban's, with the rebuilding of the west front of the abbey church during the first thirty years of the XIII cent., following G. de Eversholt (H. de GOLDCLEIF). He also perhaps superintended the rebuilding of the refectory, dormitory, and other portions of the monastery. NEWCOME, *Hist. of the Abbey*, 4to., 1795, pt. i, 99, 118. NEALE, *Abbey Church*, fol., 1877, p. 2, 11, gives the porches. BUCKLER, *S. Alban's Abbey*, 8vo., 1847, p. 84. BUILDING NEWS *Journal*, 1870, xix, 206. 19.

SISSOO. A hard wood; see DALBERGIA.

SISTANIA QUARRIES. The stone is used in the harbour of Trieste, near which town the quarries are situated; BUILDING NEWS *Journal*, 1873, xxiv, 557.

SISTO (FRA) da Firenze; see CAMPI.

SISYPHEIUM; Temple to. At Corinth, supposed by CHANDLER, *Travels*, 4to., 3rd edit., 1817, to be the temple given in STUART, *Ant. of Athens*, fol., 1794-1816, and supp. vol., 1830, drawings by S. Ittar; a statement objected to by KINNARD in the edit. 1827, iii, 115.

SITE; formerly written SCITE (Fr. *emplacement; situation*). The plot of ground on which a building stands. Archdeacon SINCLAIR, *Hints on Church Building; Sites, etc.*; in CHURCH BUILDER *Journal*, 1865, p. 172. Lord WAVENEY, *Recognition of Sites of Ancient Buildings*, at Brit. Archaeological Association, 1879; in *idem*, p. 232. On Ecclesiastical Grouping, in ECCLESIOLOGIST *Journal*, 1845, iv, 263-70. ANSTED, *Selection of Building Sites*, at ROY. INST. OF BRITISH ARCHTS., *Sessional Papers*, 9 Jan. 1871. 1. 25.

SIT-SAL. The native name for the timber of the DALBERGIA.

SITTING; see SEAT and its references.

SIVA; TEMPLE to. The god worshipped by the Brahmins in southern and western India in preference to Vishnu in the northern portion or Upper India, the two great sects of Brahmanism. Most of the old temples there are now appropriated to Siva, whose image with eight arms, and that of "the mild-looking Siva" with three heads and three eyes to each and the snakes (cobras) round the neck, are given from a temple at Barolli, in Ton, *Rajasthan*, 4to., London, 1829, ii, 707. There is no trace of tree worship (FERGUSON). Somnauth in Guzerat, and Visweswara in Benares, are two of the four great temples built to Siva. A "sevalla", at Calpee on the river Jumna, is given in KITTOE, *Illustrations*, fol., Calc., 1838, No. 10. HINDOO ARCHITECTURE. FERGUSON, *Indian, etc., Architecture*, 8vo., 1876, p. 324, describes the religion. BUCHANAN, *Mysore*, 4to., 1807, i, 335 and index. SPEIRS (late MANNING), *Ancient and Mediæval India*, 8vo., 1869, i, 259-72. 14.

SIVER. (Rom. *fossa cæca*). The term used in Scotland for a covered drain, as a pipe at the bottom of a trench. SMITH, *Dict. Antig.*, p. 46.

SIVIUS LUPUS; see SÆVIUS LUPUS (C.).

SIX. For the use of this number in proportioning, see SERLIO, *Architettura*, fol., Venice, 1663, p. 25; 378. HEXAGONAL CHURCH. 1.

SIXTEENTH CENTURY ARCHITECTURE; see ELIZABETHAN and JACOBÆAN ARCHITECTURE. FRENCH ARCHITECTURE. SCOTCH ARCHITECTURE. LEMAITRE, on Le comte DE LABORDE; *le Château de Bois de Boulogne; étude sur les Arts au XVI^e siècle*, in DALY, *Revue Générale*, 1857, xv, 33-43. LUSH, *State of the Arts and of the Sciences in France in the XVI^e cent.*; in BUILDER *Journal*, 1859, xvii, 331-3. BERTY, *Les Grands Architectes Français de la Renaissance*, 8vo., Paris, 1860. PAPWORTH, *The Renaissance, etc., in Great Britain*, 8vo., 1883. ROBINSON, *Sketches from the French Renaissance*, in Cassell's *Magazine of Art* for 1884-5. 1.

SIZE. A viscid tenacious matter of divers kinds; "a sort of jelly, or glewish matter used by painters, plasterers", to mix with some of their colours, and in preparing walls for

papering, and before varnishing paper on walls. "Double size" is a superior sort used by plasterers for the best sort of distemper colour. Paper is sized in two ways, "tub sizing" and "engine sizing". The former takes place after the paper has been made and dried; it is then soaked in a glutinous liquid, made from parchment cuttings or fellmonger's pieces, which gives the paper firmness of texture. For the latter, the ingredients are put to the stuff in the engine before it is made into paper: these generally consist of dissolved soap and alum to one engine (as it is called) of stuff. GLUE. GOLD SIZE. RESIN. ISINGLASS. 4.

SIZE OF BUILDINGS, etc.; see GALLERY; HALL, and other articles. GUILT's *Encyclopædia*, edit. 1867 and 1876. DENISON, *Book on Building*, 8vo., 1864 (and 2nd edit., 1880, p. 376). *Builder Journal*, 1864, xxii, 954, therefrom; *idem*, 1865, xxiii, 123, list with additions by Denison. Other additions, xxv, 701. By WALCOTT, in *BUILDING NEWS Journal*, 1873, xxv, 725-6. GODWIN, *English Archaeologist's Handbook*, 8vo., 1867, p. 130-1. SPON, *Architect and Builder's Pocket Book*, 1881. Von LASSAULX, in WILLIS, *German Churches*, 8vo., 1837, p. 27; and 1842, p. 225.

SKABLED WORK; see SCALPED.

SKAYER and Sqwyer (JOHN), with John Johne of Stone, masons of Edinburgh, contracted 29 Nov. 1387, to build five chapels on the south side of the parish church there. MAITLAND, *Hist. of Edinb.*, fol., Edinb., 1753, p. 271.

SKEELING. Stanford Dingley or Deaneley church, in Berkshire, is "a small and ordinary structure, consisting of one middle aisle which leads to the chancel and two side aisles built in the form of skeelings"; BIBLIOTHECA TOPOGRAPHICA BRITANNICA, 1783, No. xvi, 68. "Skillling" is a term used around Bath for a cowshed, and as such erections had originally lean-to roofs, the term became applied to a low lean-to roof as found on some of the low aisles of early churches.

SKELETON FIGURE; cadaver; emaciated; and corpse tomb, shrouded or in winding sheet. The same person is sometimes represented on his tomb with a cadaver beneath. GOUGH, *Sepulchral Monuments*, fol., 1786-96, i, pt. 1, p. cxi, attributes these figures to the xv cent. and later. They occur in Bristol cathedral; S. Mary's church, Bury S. Edmund's; S. Stephen's church, Hackington, Kent; Lincoln cathedral; Exeter cathedral; Canterbury cathedral; Besford church, Worcestershire; Tewkesbury; Burford; Wells. In S. Maries Overies church, Southwark, an effigy in its shroud is supposed to represent one who had endeavoured to fast all Lent; or of Audrey, the ferryman; THOMSON, *London Bridge*, 8vo., edit. 1839, p. 29-34. In a brass it occurs at S. Laurence church, Norwich; and one from Weybridge, Surrey, of a man and his two wives. HAINES, *Manual of Brasses*, 8vo., 1861-3, p. 44, 56, 171, 218-9.

A very rare example of a skeleton occurs in a bas-relief at Pompeii, MAZOS AND GAU, *Pompeii*, fol., 1812-38, i, pl. 29.

A skeleton, d. 1563, in church of Sta. Maria degli Angioli, or La Gancia, at Palermo.

SKELETON STRUCTURE. Usually the framework of the building. CARCASS. A skeleton barn; see DUTCH BARN. HENRICI, *Skeleton Structures, especially in their Application to the Building of Steel and Iron Bridges*, 8vo., 1866. In 1812 T. Pearshall was rewarded for thin wrought or malleable iron plates on edge, for roofs, 40 ft. or more, joists, lathed partitions, skeletons of stairs, doors, windows, etc.; REPERTORY OF ARTS, xx, 193.

SKELMANTHORPE stone supplied 1865 from near Huddersfield, Yorkshire.

SKERRIES. A small seaport, situated about eighteen miles from Dublin, the quarries being within a short distance of the Great Northern railway (Ireland). Skerries limestone (CALP) is of very durable nature and compact in texture, but not of so fine a grain as that from Sheephouse quarries, Drogheda, therefore not so suitable for ornamental or tracery work. It was used in the restoration 1858-9 by sir G. G. Scott at S. Patrick's cathedral; also at the Mater Misericordie hospital; and at numerous buildings in and near Dublin.

SKETCH (Ital. *schizzo*; Fr. *esquisse*; rough sketch *ébauche*; Ger. *skizze*). The first draught or design of a piece in painting or drawing. BURR, *Instructions in Practical Surveying, etc., Sketching Ground without Instruments, etc.*, 8vo., 3rd edit., 1858. *Field Sketching*, in CORPS OF ROYAL ENGINEERS, *Aide Mémoire*, 8vo., London, 1846, i, 521-38. 6.

SKEW or ASKEW. The term applied to an arch or bridge which crosses a road, or canal, obliquely. OBLIQUE ARCH.

Also the sloping top of a buttress where it slants off into a wall; or the coping of a gable. SENASSHELER.

SKEW ARCH AND BRIDGE; see OBLIQUE ARCH. 14.

SKEW BACK, or sommering, of an arch. The line or bed from which an arch springs; the radiating joints of the bricks or stones are the sommering lines or courses. The "sommering mould" is made of thin wainscot; (zinc is now often used). MOXON, *Mechanick Exercises* (Bricklayer), 4to., 1700, p. 39-43.

Skew back arch; see JACK ARCH. 14.

SKEW BUTT HINGE; see RISING HINGE.

SKEW FORMER. A chisel having the cutting edge very acute, used for cleansing acute angles, chiefly by carpenters. MOXON, *Mechanick Exercises* (Joinery), 4to., 1701, p. 73; 113.

SKEW NAILING. Driving the nail into the edge of a board, as in flooring, so that it shall not be seen. Several patents have lately been taken out for effecting this result.

SKEW QUOIN. In brickwork; see CUTTINGS.

SKEW TABLE. The stone built at the bottom of a gable, to carry the raking coping above up to the apex. Also the coping itself. Perhaps also the sloping projecting stone rib seen over the gable ends of roofs where they abut against vertical walls of greater height than the apex of the roof. NICHOLSON, *Dict. of Arch.*, 2nd edit.

SKIFFLING. Knocking away, or knobbling, or scalping, the rough projections of hard rock stone at the quarry. KNOBBLING; KENTISH RAG; SCALPED.

SKILLING ROOF; see SKEELING.

SKILLINGTON (ROBERT DE); see SKYLLINGTON (R. DE).

SKIMMING. A very thin coat of white put on float work in plastering to smooth it and make it white. "Coated" is the term for better work; Dublin, 1819. SETTING.

SKINNING. The scraping or chipping off the decayed surface of stone, so as to get down to the sound part. As at S. Stephen's church, and Redclyff church, Bristol, as detailed in WILLIS, *Nomenclature*, 4to., 1844, p. 9. At Durham cathedral, where so much was done under James Wyatt, R.A., it is called STUNNING.

SKINTLING. A term used in brickmaking, being the act of shifting bricks so as to admit passage of air in the hack while burning.

SKIP. A machine for raising and lowering materials in large quantities. *Builder Journal*, 1862, xx, 86.

SKIRREH. The term for the reel and cord used in laying out foundations of buildings, and of other work.

SKIRT. The projection of the eaves of a roof; MOXON, *Mechanick Exercises* (Carpentry), 4to., London, 1677, p. 169; and 1694, p. 165.

SKIRTING. The facing of wood affixed to the base of the walls of a room, as a finish between the plastering and the floor boards, whose ends or sides are thus covered by it. It is either quite plain and secured to the wall by fillets, or molded by a torus or ogee next the plaster, or more richly molded and decorated. It is also then sometimes "double-faced". It may then be necessary to fix narrow grounds, or framed grounds, to the walls to which to finish the plastering and to secure the skirting. The under edge of the skirting was formerly rebated to fit into a groove in the floor boards, but this labour is now saved; a fillet is commonly fixed on the boards and then the skirting to it and scribed to the floor. When shrinkage or a settlement takes place, a space occurs between the floor and skirting. G. A. Wright 1884 introduced "fixing blocks" applicable to brick, stone, or concrete walls, to

which the skirting could be readily secured. The top of the skirting is usually grooved to receive the setting coat of the plaster, which should always be carried down behind the skirting to prevent the spread of fire. Where a wainscot or wood dado is used to a room, a skirting forms its lower finish, like a molded plinth to a pedestal. The skirting is now very often executed in cement, especially to rooms in the basement.

SKIRTING BOARD. The narrow board fitted round the under side of wainscot against the floor (1736).

SKIRTS. One or more superficies laid in plano, but which would cover a body without leaving any interstice, or without one part lapping upon another. The sides of a room, when laid out in this manner, are called "skirts".

SKITTLE GROUND. A shed arranged for the game of skittles. It is usually attached to the lower class of public-houses, and to country inns, for the recreation of labourers and others. A double shed requires to be 40 ft. long and 21 ft. 6 in. wide. A skittle and bowling alley is 43 ft. 6 in. long and 18 ft. 6 in. wide, 12 ft. 6 in. being for the former and 6 ft. for the latter. The article **BOWLING ALLEY** shows an American arrangement of a superior character. *Handbook of Games*, in Bohn's Scientific Library, 8vo., London, 1850.

SKLATTER as used 1456 for **SLATER**.

SKORYNGE; see **SCOURER**.

SKREEL. A set of shelves for crockery, fixed above a dresser.

R. R. R.

SKREEN; see **SCREEN**.

SKUZCOWICZ of Poland; see **ROSSI** of Rome.

SKULL; see **CRANIANUM**.

SKUNCHION, Skonchon, Skownsiom; see **SCUNCHEON**; and **Scunich**, see **SCONSON**.

SKYLIGHT (Fr. *abat-jour*). An opening in a roof to admit light from above to a room or passage. It has a framing of one or more inclined planes, some or all of which are glazed and have outside flashings of lead. All good picture galleries and exhibition rooms have skylights. This term is not used in the Dictionary of 1736, only **LANTERN** or **Lanthorn**. **DEFOE**, *The Complete Tradesman*, 3rd edit., 1736, i, 248, writes "false light, every artificial side window, sky-light, and trunk light made to—deceive the buyer." In ii, pt. 2, p. 162, he states that "Paternoster Row was built for the Mercers, the spacious shop, back warehouses, skielights and other conveniences made on purpose for the trade are still to be seen."

1. 4. 14.

The light from a skylight depends upon the distance it is from the floor; light is said to diminish as the square of its distance. **LIGHT**; **NATURAL**. Open skylights are very apt to reverberate; so are deep and square window recesses; both ought to be avoided where sound is of great importance. The skylight in cold weather rapidly cools the air, and it descends to the inconvenience of the occupiers of the room; a false or flat skylight is usually adopted under the outer one. Precautions have to be taken to let off the condensed vapour and any wet that may get in. The patent systems of glazing are also skylights; such as the "Eclipse"; the "Acme"; the "Standard"; the "Perfection"; the "Imperishable"; the "Pennycook"; the "Simplex"; "British patent"; the "Indestructible"; the "Dry glazing". **GLASS** or **GLAZED ROOF**. *Top Lights in Buildings*; in New York; *BUILDING NEWS Journal*, 1859, v, 579. **CAFES**, *Light: its Influence on the proper Arrangement in the Plans of Buildings*; *BUILDER Journal*, 1860, xviii, 182.

14.

Glass in the high or sky-light to the apodyterium of the public baths at Pompeii had bronze frames; the broken glass found perhaps belonged to them; **STARKE**, *Travels in Europe*, 8vo., edit. 1830 or 1839; p. 310-11; **DYER**, *Pompeii*, 8vo., 1868, p. 160.

SKYLINE. The term used about 1860 to denote a picturesque arrangement of roof, chimney shafts, turrets, and architectural accessories, breaking up the usual formal ridges of roofing. **VIOLLET-LE-DUC**, *Dict. Rais.*, 1856, s. v. **Balustrade**, p. 88. A. J. B. B. **HOPE**, *Skyline in Modern Domestic Buildings*,

read at Roy. Inst. of Brit. Architects, *Sessional Papers*, 14 March 1864.

SKYLLINGTON (**ROBERT DE**), mason, was appointed 1392 to hire twenty diggers of stone, carpenters and labourers, and to provide stone and other materials, for the additions made by the duke of Gaunt at Kenilworth castle. Pat. 15 Richard II, p. 1, m. 40, in **DUGDALE**, *Warwickshire*, fol., 1656, p. 249. **DALLAWAY**, *Discourses*, 8vo., 1833, p. 377, 422. **WALFOLE**, *Anecdotes*, edit. Dallaway, 1826-8, i, 213, 326.

SLAB. A large flat but not very thick portion of any material. **ALTAR SLAB**; **MENSA**. **GLAZIER**. **PLATE IRON**; **BOILER PLATE**. **FLITCH**. *Stone*; see **FLAG** (41*). Sawn slabs from **Harehill**, Park spring Gazeby, and **Robin Hood**. **LANDING**. **PAVING**. **PAVEMENT** (66*). *Paper*, for roofing purposes; see **PAPER**; and **SLATE**, artificial. *Marble*, as in front of a fireplace, or chimney opening. A slab of marble 17 ft. by 7 ft. is mentioned s. v. **Lucca**. **BORDER**. *Slate*; suitable for flooring, paving for streets, window sills, chimney pieces, skirting, water cisterns, and other tanks, malting floors, sinks, managers, flower boxes, table tops, and tombs, and for enamelling; from 60 to over 100 super. ft. in one slab; as 18 ft. by 6 ft. Slabs from the **Valentia** slate company, June 1857 ran "under 6 ft., 8 ft., and 10 ft. long by 3 ft. 6 in. wide, and 1 in., 1½, 1¾, or 2 in. thick". The largest slate slab in the Exhibition of Industry 1862 was sent by the **Llangollen** slate company, 20 ft. long, 10 ft. wide, weighing 4½ tons; thickness not named. *Wood*, the outside sappy board, of unequal thickness, sawn off a log before it is sawn into boards.

SLAB for tombs; see **MEMORIAL**. **SEFULCHRAL MEMORIAL**. At Florence, in the church of Sta. Croce are memorial slabs inlaid or intersiated with coloured marbles. In S. Lorenzo the tomb to Cosmo de' Medici, died 1464, consists of a slab of porphyry, inlaid with verd antique and marbles. A slab of cast iron, 1660-90, in churchyard of Himbleton church, Worcestershire; another very early, in Burwash church, Sussex, having a cross on it.

SLAB BOARDING. Thick (say 1½ in.) boarding to carry slates, tiles, or lead, and nailed from purlin to purlin where there are no rafters. **BOARDING**. **BINDING RAFTER**.

1.

SLAB-DASHING; see **STENCILLING**; **DAUB**; **ROUGH CAST**.

SLAB EDGED or Dutch cut; see **RIGA TIMBER**.

SLAB PLASTERING. A patent taken out by R. W. Hitchens for "rapid slab plastering", made of fibro-ligneous slabs of cement or plaster, to be used for ceilings and partitions, in lieu of lathing and plastering. As the material is chiefly sulphate of lime, the slab will stand intense heat. The three coat work of plastering weighs about 70 lb. per sup. yard; but the slab is not more than one-third of this weight and less in thickness.

SLAB SLATE ROOF; see **SLATING**; patent.

SLACKE; properly written **SLAKE**.

SLACK LIME; see **SLAKED LIME**.

SLAG or cinder (Ger. *schlackenkopf*). The molten mineral product of smelting furnaces. Slags from iron (as Dowlais) furnaces are usually composed of silica, 40.4, lime, 38.4, alumina, 11.2, and magnesia, 5.2, in combination with traces of protoxide of iron, sodium, potassium, carbon, manganese, sulphur, titanium, and phosphorus. In the utilisation of slag, by the process of refining, casting, pressing, rolling, moulding, and annealing, the extremely liquid molten state of it in the smelting furnace is available for suitable appliances to impart to it any desired form, colour, or texture. It can be rendered brittle or tough, hard or soft, compact or porous, rough or smooth. It can be cast like iron with the addition of colour; and when annealed, the surface can be made more durable than marble with a polish equal to agate. *BUILDING NEWS Journal*, 1871, Oct. 13, xxi, 280. For glass, *ARCHITECT Journal*, 1876, xvi, 196; and *BUILDER Journal*, xxxiv, 955. Various kinds of pottery ware are made of slag after a chemical process; Sept. 1885. Pyrolite or artificial lava was referred to at the Society

of Arts, 17 April 1848. Dr. G. Robinson of Newcastle, patent 27 Aug. 1853, for sheets or plates; CIVIL ENGINEER, ETC., *Journal*, xvii, 326; *BUILDER Journal*, xii, 468. W. G. Elliott of Blisworth (*idem*, 1854, xii, 368; xiv, 124, had been engaged in making slag bricks, tiles, and pipes. Messrs. Chance of Birmingham had a patent for preparing cast stone which was made from a hill of basalt near Wolverhampton; it was melted and cast in moulds to patterns. Dr. W. H. Smith of Philadelphia, read *The Utilization of Slag*, at Society of Arts, 28 March 1855, which drew attention to the subject, and he patented the process. *HOUSEHOLD WORDS Journal*, 1855, p. 376.

Road-making. Slag was previously entirely useless except for this purpose. At Hedingham (Essex), the surveyor proposed that slag should be used in the repair of the roads, as it could be delivered from Northamptonshire to Sudbury for 11s. 6d. per yard. At the blast furnaces of Osnabrück, Hanover, slag is broken up by a method which, under some circumstances, might be adopted elsewhere. The molten slag is allowed to fall from a height of about 8 feet into water, and is thus formed into a large bean-shaped gravel. From the water-tank it is lifted by "Jacob's-ladders" and is conveyed away as fast as it is produced, and largely used for ballasting railways, or for other road purposes. At Stockton the foundations of all roads and streets 13 in. thick are formed of slag; and when crushed to about 1½ in. cubes it makes excellent concrete. The lower layer is formed by hand punning and covered with finer material. For paving stones, *BUILDING NEWS Journal*, 1865, xii, 652; and iron, wood, and granite for The Poultry in London, *idem*, xii, 815.

A *Slag church* at Oakengates, Shropshire; *BUILDER Journal*, 1855, xiii, 582; showing its use like Kentish rag or other rubble stone.

Slag brick is an artificial stone of a dark colour, made of some sorts of *copper slag* and used for furnace houses, factory, farm, field, and other walls, in South Wales, Chili, and South Australia. The slag as it is tapped from the furnace is let into iron moulds. In South Wales the price to the furnace man is one penny per brick. Slag bricks while very durable, will break on a smart blow; *SOCIETY OF ARTS Journal*, 19 July 1861, p. 620. Slag coping of *copper slag*, is much used in Swansea and elsewhere in South Wales. In its rough state it is used in South Wales and Chili for piers and embankments, but it is always porous.

Slag is the best material for concrete buildings, as having been subjected to intense heat all loam, clay, etc., that would tend to kill the cement have been removed, while its rough, honeycombed character forms a perfect key in the work. About two-thirds of the quantity required should be broken to the size of walnuts, with sufficient of still smaller to fill up the cavities between; the remaining one-third should be used in lumps (but not larger than two-thirds the thickness of the wall) and packed in layers in the centre of the wall, the smaller, mixed with cement in the proportion of 8 to 1 being poured round; *HOOPER* in letter, June 1874. Slag concrete, 1880, was adopted for the municipal offices, grand theatre, and school board offices at Leeds; and by railway companies for station platforms; as carried out by the Airedale hematite iron company, Leeds.

SLAG WOOL, or silicate cotton or hair slag (Ger. *schlackerwolle*). A pure mineral fibre made from blast furnace slag. It is white in colour and like spun glass. At its first manufacture it gave rise to the emission of free sulphuretted hydrogen, and was objectionable as filling the air with fine penetrating particles; this has now been obviated. Qualities of slag vary as they depart from the normal proportions of silicic acid 56 parts, calcium 30 parts, and alumina 14. Among the first to prepare this wool were the blast furnaces at Osnabrück and Zwickau, by sending the blast air or steam through the melted slag. It is stated to be imperishable and incombustible. A pad of 2½ in. thick can be made red-hot on one side, the other will

remain cold. It is extremely light, a cube foot weighs only from 16 to 18 lb., and one ton covers about 2,400 ft. one inch thick; vermin cannot live in it or pass through it; either loose or felted it is a good substitute for pugging, or deadening in floors, and for lining partitions to prevent sound passing through; also for a non-conductor as "lagging" or covering to boilers and hot-water pipes, it being the best non-conductor of heat. "Slag felt" is the cotton made into cakes 2 ins. thick as supplied for partitions; this for refrigerators is considered as equivalent to 6 in. of charcoal or sawdust.

SLAKE, often written *SLACK* (Fr. *détreindre*, to slake; Sp. *azogamiento*). An ancient word used in the West Riding of Yorkshire, meaning "to smear, to wet, or to bedaub"; *ARCHÆOLOGIA*, 1814, xvii, 158.

SLAKED or *SLACK LIME*. Hydrate of lime. Lime or quicklime either as taken from the kiln, or first ground, and a proper quantity of water poured upon it, when it falls into a thick paste, and occupies double its former bulk. So much heat is produced by this slaking, especially of good lime, that part of the water is evaporated, and it is sufficient to set fire to combustibles. *BRANDE* gives the proportion of 28 parts of lime to 9 of water by weight; too little fails to bind the mass, and too much swells out the stuff. To remove the "core", i.e., insufficiently burnt lime, it is often necessary to screen the whole mass after slaking. Quicklime exposed to the atmosphere is slowly reduced to a fine powder, with slight heat, but no perceptible vapour. Hydrates of hydraulic lime immersed in water as paste acquire hardness by immersion. In making concrete, the proper slaking of the lime should be carefully attended to before mixing it with the gravel or ballast, as is the case on the Continent. *REID, Practical Treatise on Concrete and how to make it*, 8vo., London, 1869. *DAVY, On Slaking*, at British Association; in *BUILDING NEWS Journal*, 1863, x, 699. *PASLEY, Cements*, p. 6, 23-6. *TREUSSART, On Mortars*, in *CIVIL ENGINEER, ETC., Journal*, 1838, i, 250. *BETON. CONCRETE. LIME MORTAR. SETTING. WIND* or *air SLAKING*.

SLANE. A bishopric in Ireland now united with Meath.

SLANT or *Slope* (Fr. *descente*; *devers*).

SLATE, formerly written *sclette* (Lat. *ardesia*; It. *lavagna*; Sp. *pizarra*; Fr. *ardoise*; Ger. *schiefer*). A sedimentary rock formed by the deposition of minute particles of the primary rocks as a stratum of mud, subsequently consolidated by heat or pressure, and frequently fossiliferous. Most slate is readily divisible into thin plates.

Slate for roofing and domestic purposes, is quarried in Westmoreland, Yorkshire, Leicestershire, Cornwall (*DELABOLE*), and Devonshire (*TAVISTOCK*). In North Wales occur the finest veins of slates, the two largest and best being the Caernarvonshire and *FESTINIOG* range. The vein in the former is stated to extend from Aber, running in a south-westerly direction to Pwllheli, and in this range occurs the celebrated *PENRHYN* quarry, and others. The Caernarvon slate is so called from being shipped from Caernarvon; its colour is inferior, the texture coarser and more irregular, the planes of cleavage not so absolutely defined, and from the unevenness of surface thus produced, this slate is more exposed to be affected by frost, than the more regularly bedded slates, obtained in the same county and from the same geological formation as at Bangor and Bedgelert. Thus the Bangor quarries supply the best slates. The best Bangor slates are "Bangor blues"; in first quality they are higher priced than grey, as are also Bangor reds; but in the second quality the grey are the highest price. The Westmoreland slate is considered the hardest and most durable of slates; the cleavage is bad and hence it is thick and rough: many government buildings were formerly covered with it as the necessary timber to support the weight was not an object; *BUILDER Journal*, vi, 80. *Ireland* obtains slate from Valentia island, co. Kerry; and from Cahirciveen; Bantry; Glanmore, Killaloe; Letterkenny; Skibbereen; and Victoria quarries near Carrick-on-Suir; and other places;

for local use chiefly; as a very large quantity is obtained from Wales. WILKINSON, *Geology*, 8vo., 1854. Scotland obtains slate chiefly from Ballachulish and Easdale (SCOTCH SLATE; ABERDEEN), used locally, being very thick and heavy. By far the largest quantity of slates used in the United Kingdom and on the Continent are from North Wales, and from the two counties of Caernarvon and Merioneth; Bangor, Port Winorwic, Caernarvon, Portmadoc, and Aberdevev being the ports of shipment: Treganwy near Conway, will probably soon be an outlet for shipping a good portion of the slates quarried at Festiniog. The slates obtained in *Foreign countries* are not referred to in this article.

Slate is superior to most other articles for roofing purposes, for lightness, durability, and capability of resisting moisture. It imbibes only about one two-hundredth part of its weight of water, while some glazed tiles will imbibe one-seventh their weight. Even if immersed in water for three months, it will be found to be dry beneath a fresh scratch. Ordinary slates cannot be used for flats, but they are used for a lower pitch than tiles; they are damaged by fire, as they crack and fall to pieces at a high temperature, and by a heavy tread on them when on roofs. They are also more easily displaced by high winds than tin, zinc, or lead, in consequence of the wind gaining entrance at the joints if not well laid. The best slates have a hard and rough feel; a greasy-feeling slate is much disliked as it shows an undue proportion of alumina and is generally soft in consequence. Professor ANSTED states that the best slates are the most crystalline, and when breathed upon give out the faintest argillaceous odour; when given out strongly, the slates readily decompose. Slate slabs from Valentia, co. Kerry (which began to be largely imported in 1841-2) are stated to be more brittle than Bangor slate; Festiniog slate as not durable; and Westmoreland slates, which are extremely durable in other places will not last in London; in INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1839, i, 34. The Llangollen slates are said to last only about 30 or 40 years; BUILDER *Journal*, 1857, xv, 520. SLATING.

The best slate is considered to be of a bluish-grey colour, which breaks before the "zax", or chopper, like well-burnt pottery, and rings in the same manner on being struck. Whitish or light grey slate is for the most part stony; dark blue, or blackish slate, on the other hand cuts very freely, but it absorbs moisture, and decays rapidly. Magnesia enters largely into the composition of some slates, giving them a *Green colour*, whence they pass into chloric or talcy slate. This coloured slate is now supplied from Coniston, from Maryport; Whitland abbey; Penmoyle; Caernarvon; Bryn Hafod y wern quarry; and Buttermere at Keswick; with the American "Eureka unfading green", and "permanent green" slates. *Blue and red* also from Caernarvonshire. *Grey* from Bangor; silver grey from Machynlleth. *Pale blue* from Kendal. *Grey blue* from Cornwall. *Purple grey* from Swithland, Leicestershire. *Best blue* from the Welsh slate company. 1. 2. 4. 14. 19.

The names formerly applied to certain scantlings of slates for roofing purposes are given in HOLME, *Academy of Artistry*, fol., Chester, 1688, b. iii, ch. v, p. 265. The names by which they are now popularly known (as countess, ladies, etc.) are said to have been given by general Warburton, proprietor of some large quarries in North Wales, about 1750; NOTES AND QUERIES *Journal*, 1857; BUILDER *Journal*, 1857, xv, 468; 520. These modern names are given s. v. in this work. Until about 1854 slates were only hand-made. By Mathews's patent slate-cutting machine then perfected, a workman dressed at the quarry in three hours 1,404 slates, equal to 4 tons 4 cwt. 3 qr. 23 lb, without breaking a single slate and all square. The best quarryman cannot dress more than from 3 to 4 tons a day (11 working hours), and seldom all square; while during his training he will have broken hundreds.

One of the many slate-dressing machines is described in BUILDER *Journal*, 1860, xx, 467.

ARCH. PUB. SOC.

DAVIES, *Treatise on Slate and Slate Quarrying*, 8vo., London, 1878; T. C. SMITH, *Slate Quarries in Wales Considered*, 8vo., 1861. WILKINSON, *Geology, etc., of Ireland*, 8vo., London, 1845. UNIVERSAL MAGAZINE, 1766, describing a quarry, states "slate is rather better known in Ireland and in France than in England, on account of the quarries therein; none, however, in England are ignorant of its utility for covering houses"; xxxviii, 225; 353. BUILDER *Journal*, 1862, xx, 526, slate as displayed at the London Exhibition. CORPS OF ROYAL ENGINEERS, *Papers on Engineering*, iii. HIGHLAND SOCIETY, New Series, iv, 53, 81, 98. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1855-6, xv, 64. BUILDING NEWS *Journal*, quarries in Scotland, 1869, xvi, 8: visit to Festiniog quarry, 1877, xxxii, 24. ILLUSTRATED TIMES, 1862, Oct. 11, p. 392, gives good view of Penrhyu quarries.

The history of the use of slate is perhaps unwritten. The Roman houses at Uriconium appear to have been covered with rather thick slabs of micaceous slate from Wales. In Belgium, its use was not found by SCHAYES, *Hist.*, 1850. In France, slate was quarried in Normandy and Anjou; and its decorative use is detailed in DELAQUÈMIÈRE, *Essai sur l'Épis, etc.*, 8vo., Paris, 1846. 23 Henry III "scolata" were used to cover a mill at Woodstock; and 17 Henry VII, 34,000 "ardois" were used. A slated house in Craven, Yorkshire, *cir.* 1300, is noticed in WHITAKER, *Craven*, 3rd edit., 1878, p. 512. In 1736 "blue slate" is named, as against HORSHAM STONE SLATE, for use in summer houses in gardens (4). ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1885, p. 103.

The strength of slate:—To fracture slate. Valentia, 3 in. by 3 in. by 3 in.; 30.4 tons on the whole surface; 3.38 tons per inch square; to crush it 47.6 tons on the surface; 5.29 tons per inch square. Inch cubes placed on natural bed, average to crush 5.14 tons per square inch; with the laminae vertical 5.98 tons. Specific gravity of common slate 2672. INST. OF CIVIL ENGINEERS, *Transactions*, vol. i. A slab 2 ft. 10 in., 4 in. thick, and 4 ft. between the bearings, failed with 24½ tons distributed over 15 in. at the centre of the span. Cast iron of the same dimensions would scarcely support five times as much and would be 2½ times as heavy; CLARK, *Britannia, etc., Tubular Bridges*, fol., 1850. An inch slab of slate is equal to York paving 2 or 3 in. thick, granite 3 to 4 in., and marble 8 to 10 in. A foot super. one inch thick weighs 14 lb. A piece 5 ft. 6 in. long, 5½ in. wide and nearly 2½ thick, planed fair both sides, on supports 5 ft. apart, was loaded in a pyramidal form, broke with 1 ton 5 cwt. 3 qrs.; perhaps would have stood a greater weight if not planed; CIVIL ENGINEER, *etc., Journal*, 1841, iv, 185. Other tests on Bangor and Llangollen slates in 1850, xiii, 269; and ARCHITECT *Journal*, 1850, ii, 320.

By experiments of G. Reunic upon slabs laid flat on bearings 10 in. apart, each 12 in. long, 2½ in. wide, and 1 in. thick. The weight suspended from the middle sustained—

		Cwt. qr. lb.
1. Green Moor and Yorkshire Bluestone	...	2 3 27
2. Do. do. Whitestone	...	3 0 23
3. Caithness (Scotch) stone	...	7 2 17
4. Valentia (Irish) slate	...	7 3 3
5. Bangor slates (Welsh)	...	17 0 12
Buchanan tried—		
Hailes		794
Craigleith	3 ft. long, 9 in. broad, 3 in. deep	1,148
Arbroath		1,848
Caithness	3 ft. " 8½ " 2½ "	3,291

A very hard specimen. The weights were piled on.

"Glass slates" in roofing to lofts are sometimes used to admit light. Slate laths have been advocated (LATH, p. 29). A "slate ground for plastering", cut out of misshapen slates fixed a quarter of an inch apart, is described in GWILT, *Encyc.*, 1876, § 2246c; but it would be inconvenient in partitions where screws or nails would be used. "Slate roll ribbing" and "slate rolls" to roofs; see RIDGING; and "The Garth" patent water-tight slate ridging, Bangor, Oct. 1874; the wings or flyers screwed to the ridge piece, abutting against a hard wood, slate, or metal tongue about ¾ in. by 2½ in., let into the ridge, and on

A A

which the slate roll is set in oil cement. "Slate dowels" are much used as they do not contract and expand as do metals. *Sawn slate* is now extensively used for cisterns, in urinals, chimney-pieces, tombstones, washing establishments, and numerous other purposes.

SLATE; ARTIFICIAL. Non-bituminous cardboard for roofs of barns, granaries, outhouses, etc., is a strong fibrous kind of cardboard made from old ropes, and covered with metallic cement, to a great extent waterproof and fireproof; invented by M. de Ruolz, and used 1858 largely in France. The board used in Russia, Sweden, and Norway, is described in *MECHANIC'S MAGAZINE*, 1824. They were also brought forward in the Exhibitions in London of 1862 and later. *Roofing Paper and Wood Cement* in North Germany, in *ROYAL INSTITUTE OF BRITISH ARCHITECTS, Transactions*, 1885, p. 103-4. STANHOPE'S PATENT for roof covering. *SHINGLES. PAPER* (p. 35a). 2.

SLATE; ENAMELLED. The process was discovered by Magnus of Pimlico, about 1841. Slate undergoes five distinct operations: 1, ground coating, burnt in and afterwards rubbed down to a fine surface for the work of the decorator; then the first coating of enamel, heated and rubbed down; followed by two other coats each thoroughly burnt in at 350 to 600°; and then polished. In outdoor work it lasts for many years. *BUILDER Journal*, 1856, xiv, 692 ads.; 1857, xv, 1. *Jurors' Reports* of the Exhibition of Industry, 1851. A manufactory for articles of *sawn slate*, too numerous for naming here, plain or enamelled, is described in *CIVIL ENGINEER, ETC., Journal*, 1841, iv, 185. *Slate and its Uses, BUILDING NEWS Journal*, 1870, xix, 209.

SLATE BOARDING, called "sarking" in Scotland. Also called "sheathing". Doubles and ladies require boarding for a weather-proof covering. Battens $\frac{3}{4}$ in. by $2\frac{1}{2}$ or 3 in. are used with countess slates, for larger ones 1 in. thick. The boarding is often nailed diagonally on the purlins, thus saving the expense of rafters, and then $1\frac{1}{4}$ in. boards should be used. This boarding will save wind braces if nailed diagonally, but there is much trouble in cutting the heading joints. Where the roofs are open, the boarding should be wrought and tongued, and beaded and matched.

SLATE BUILDING. Where house walls, as at ANGERS and in Normandy and in Wales, are built of slate blocks, they should not have flat beds, but made sloping outwards to prevent the inlet of water, driven or sucked in. Partitions are made of slate slabs. The town hall at Liskeard, Cornwall, has the upper walls of local slate, in tooled ashlar with cement vermiculated main quoins and window dressings and eaves cornice; designed 1859, by C. Reeves of London; *BUILDER Journal*, 1859, xvii, 684. 1.

SLATE CEMENT. Waste slate ground to powder and mixed with coal tar is said not to run in the sun, or crack from frost; and therefore suitable for covering a flat roof formed of plain tiles or deal boards. If kept for a long time it gets very tough, and when exposed to the air, hardens so that it can hardly be cut with a knife. It is strongly recommended as better than any other of similar material in America; *BUILDER Journal*, 1866, xxiv, 655. **SLATING; PATENT.**

SLATE COLOUR. This is represented by a mixture of white, lamp-black, and a little Indian red.

SLATER, written sklatler in Scotland, in 1456; SPALDING CLUB, *Cavalier Papers*, 4to., Edinb., 1859, 26; also called HILLIER. (Sp. *pizarros*, men who came 1559-61 from Flanders to arrange the tiles on roofs, and to work at Madrid and other royal residences, LLAGUNA, ii, 201). MOXON, *Mechanic Exercises*, 4to., 1677, gives "tyling" under Bricklayers' work. The Edinburgh slaters from 1703, besides doing roofing work, occasionally did rough-cast and paint walls, repair chimney-pots, and put on eans: their habit of climbing renders them eligible as firemen; *BUILDER Journal*, 1852, x, 773; condensed from the *EDINBURGH NEWS*, Oct. 1852.

The tools used by the slater consist of: the *scantle*, a gauge for regulating the length of the slate; the *saice* or *zaw*, or

hand-pick, for cutting the slate; the *block* on which to cut it; the *trowel*, *hod*, and *mortar-board* for the mortar or lime and hair for setting slates when boards are used (which is sometimes done, especially where large slates are used), and for closing up, rendering, or pointing, the joints on the underside of slating on laths; this mortar is made of equal portions of lime and sand, with one pound of dried and well-beaten hair to three cubic feet of lime; *nails*, either iron, tinned iron, iron dipped in oil just before use, zinc, or copper (no iron nails can be permanently relied upon); the *ripper*, for ripping off the heads of the nails in reslating or repairs; *tilting fillets* or slates, for nailing along the extreme edges of the roof; and the *shaving-tool* for getting slates to a smooth face; with chisels, gouges, and files, ladder and steps. FELT, asphalted, or inodorous, and hay, or moss, is often laid over the boarding to obtain a more equable temperature in winter and summer. Tarred felt is only used as a covering for temporary sheds. NICHOLSON, *Diet of Arch.* 1. 2. 4.

SLATER (WILLIAM), born 1818, at Dasselbeech, Northamptonshire; apprenticed 1834 to R. C. Carpenter; about 1853 in conjunction with William Smith restored Weldon, Islip, and Stanwich churches; designed new parsonage at East Haddon; the town hall at Loughborough; and restored Brixworth church. On Mr. Carpenter's death in 1855, he took his office and completed Bedgebury park; Lancing, and Hurstpierpoint colleges; Earls Shilton and Sompington churches; succeeded him as architect to Chichester cathedral; and at the restoration of the choir in Sherborne abbey; designed new buildings for the King's school and S. John's almshouses, Sherborne; and many church restorations, as also in his native county; designed the new churches at Edinburgh, Belfast, Bray, Dunkeld, S. Kitts, Devizes; 1861 Harpenden, Herts; and Moggerhanger; 1857-60 the new cathedral at Kilmore; and since 1858 restored Limerick cathedral; and 1862 the font in Lichfield cathedral; many houses, parsonages, and schools; commenced the restoration of the choir of Chichester cathedral, and with sir G. G. Scott the rebuilding of its central tower and spire; and with T. H. Lewis, the restoration of part of the priory church of S. Bartholomew the great, Smithfield. R. Herbert Carpenter having completed his articles with him in 1863 became partner and together they completed the choir at Chichester, Hurstpierpoint chapel, new churches at Bootle, Outrington, Dumfries, Belfast, Church Lawford, Southend, Milton, Burwash-weald, and others; and commenced the new cathedral at Honolulu. Restored many churches; and Brigstock manor-house for the duke of Buccleuch; Holdenby house; and the bishop's palace at Chichester; designed new mansion for lord Salisbury in Arlington street, Piccadilly; mansion at Seacox heath for G. J. Goschen, M.P.; the new colleges of S. Chad at Denstone; and S. Saviour at Ardingley; new buildings of S. Nicholas college at Lancing; and the King's school buildings at Sherborne. He died 17 Dec. 1872 in his 54th year. *ROYAL INSTITUTE OF BRITISH ARCHITECTS, Transactions*, 1873-74, p. 214. *BUILDER Journal*, 1873, xiv, 83; xvii, 365, gives many private and other works.

SLATING. The slate now used in roofing is a thin riven slab. The upper surface is called its *back*; the under surface the *bed*; the lower edge the *tail*; and the upper edge the *head*. In each course of slates the upper part exposed to view is the *gauge*, *bare*, or *margin* of the course; the under part is also called "margin" by some; the width of the upper "margin" is called the "bond" or "GAUGE"; the part hidden from view is the *cover*; the distance between the lower edge of any course overlapping the slate of the second course below is the *BOND* or *lap* and from the nail-hole may be $2\frac{1}{4}$ to 4 in. (See *BOND* with cut.) In preparing a slate for use, the sides and bottom edges are trimmed, and the usual two nail-holes punched according to the "lap" required. The most secure method of nailing the slate on open battens is as near the centre as possible; Duchess slates to be gauged 14 in. from the bottom and holed on the outside one

inch from each edge; *BUILDER Journal*, 1864, xxii, 727; 744; 795. The slate is secured to laths, or battens 3 in. by $\frac{3}{4}$ in. after the saw, or to inch boarding or sheathing, and must break joint. The nails either oak pegs, or of lead, copper, zinc, tinned iron, or best wrought iron clout well dipped in oil before use. The smallest size slate takes 480 nails and the largest about 250 per square. In England 1,200 slates constitute "a thousand", which cover from two to fifteen squares according to the size of the slates, and weigh from $\frac{3}{4}$ ton to 6 tons on the same basis: 480 slates of the smallest size or 127 slates of the medium size (duchesses) will cover a square. The thickness of a slate ranges from 3-16ths to 5-16ths of an inch; and its weight from 2.6 to 4.53 per square foot. Tables of sizes and quantities are given in most *Price Books* and *Slaters' trade lists*. The price of "stone slating" in 1812 was 15s. per square. *NICHOLSON, Dict. of Arch.* The external walls of houses in exposed situations, especially at the seaside, are often slated to keep out wet, in lieu of cement. Such work in France is described in the publication named in the third paragraph *s. v. Slate*. 1.

Slating is sometimes laid lozengewise for ornamental effect, but it is much less durable than when laid in the usual method; the ends are rounded, or cut angleways to a point, or the angles only cut off; or if the slates be of a small size, they are set angleways over courses with square ends. These are shown in *VIOLLET-LE-DUC, Dictionnaire, s. v. Ardoise*. Slating is also done in zigzag patterns with red slates among blue slates; or a few courses of the one above a larger number of the other.

SLATING; PATENT. A patent was obtained by James Wyatt about 17... for forming roofs with "slate slabs". The slates were reduced to widths equal to the distance between centre and centre of the rafters. On the backs of these last the slates are screwed by two or three strong inch-and-half screws at each of their ends. Over the junctions of the slates fillets of slates about $2\frac{1}{2}$ or 3 in. wide, bedded in putty or a cement, are screwed down, to prevent the entrance of rain. The regular appearance of this slating gained it much celebrity; but it was abandoned on account of the disorder it sustained from any settlement, not less than from the constant dislodgement of the putty, upon which greatly depended its being impervious to rain. 1. 2.

The *joints* are generally made with tongues in grooves set in cement, covered by ribs; but it is difficult to make a joint that will stand, on account of the material swelling and shrinking, and it is disturbed by a slight settlement. Attempts to remedy this disadvantage are seen in Taaf's patent and in the so-called improvement by Russell, in both of which the principle of **I** cramps and screws; or nails with zinc gutters under each line of junction of the slate, is adopted. Lead drawn in grooves and covered by ribs set in putty on the slates, screwed down to the rafters is a good arrangement, as no gutters are required, and holes in the slate are avoided as much as is possible. A "patent elastic cement" used with the slates sawn by the patent machine of the Welsh slate company is stated "to present the most beautiful and perfect roof obtainable", about 1854: directions for use were to be obtained from that company. White lead and litharge are also used to form a water-tight joint.

Helliwell's new (1878) system of slating with very strong zinc slates, 4s. 6d. to 5s. 6d. per yard, as advertised.

SLAUGHTER-HOUSE (Ital. *decheria*; Fr. *abattoir*; Ger. *schlachthaus*; Med. *"lardaria que vocatur slaughterhaus"* occurs in works of J. Forcer, prior of Durham cathedral, *ob.* 1374; *SURTEES SOCIETY, Hist. Tres. Sent. Soc.*, App. cxli; also TURNER AND PARKER, *Dom. Arch.*, ii, 138-9). A place for killing animals destined for food. It should be flagged with an incline to a central grating that the floor may be flushed with water; and have a drain for blood, whilst the offal may be thrown upon the dung-heap. A sink, water supply, boiler for scalding, iron suspenders, large galvanised meat-hooks, hoisting tackle, chopping block of American ash, and a ladder of three or four steps, are also required. The Metropolis Act, 37 and 38 Victoria,

cap. 67, October 7, 1874, empowered inspectors of the Privy Council to enter slaughter-houses and knackers' yards (*LABOULAYE, Dict.*, s. v. *Abattoir des chevaux*), for the detection of disease. Bye-laws for regulating the conduct of the business of a slaughterer of cattle were drawn up by the Metropolitan Board of Works. *Detached Essays*, Abattoir, with three plates. BURNELL, *Abattoirs at Paris*, in *BUILDER Journal*, 1850, viii, 2, 29, 38. DEAN, *Essay*, 4to., 1849, p. 29, gives one with specification. "Public Slaughter Houses" in BOULNOIS, *Municipal and Sanitary Engineers' Handbook*, 8vo., 1885. HENNICKE, *Bericht über Schlachthäuser und Viehmärkte*, fol., Berlin, 1866, gives foreign and English examples. HENNICKE UND HUDE, *Schlachthaus und Viehmarkt in Buda-Pest*, fol., Berlin, 1876. DARDISHIRE, *Public Abattoirs*, read at INST. OF BRITISH ARCHITECTS, 1 Feb. 1875, referring to those at Manchester. MEAT MARKET. 1.

SLEDGE, or **SLEDGE HAMMER**. A large hammer used by the smith with both hands in beating out iron on the anvil. The "about sledge" is one swung round over the head with both hands, to strike with all the might, in battering or drawing out the largest work. The "uphand sledge" is used by under workmen with both the hands before, but seldom raised higher than the head, being for work of smaller size. 4.

SLEEPER (Fr. *chantier*). The name now applied to a piece of timber employed to support others, as the joists of a basement floor in a building. These are often themselves carried by **SLEEPER WALLS** or piers of brick or stone work. Jennings had patented 1857 a "sleeper block" of pottery, as a non-conductor of damp and a cheap substitute for brick work. "Sleeper" is also the timber upon which the chairs are fixed for carrying lines of rails on a railway; it is laid in or on the ground either longitudinally or transversely, it is usually 5 in. thick, by 9 in. wide, 9 ft. long, and fixed 3 ft. from centre to centre. As oak is too expensive fir is used after being impregnated with some preservative method. BREESE, *Illustrated Glossary*. 1. 4. 19.

Sleeper is described as the same as "purlin", in *MOXON, Mechanick Exercises* (Carpentry), 4to., 1679, p. 169; and 1694. This term has also been explained as "the oblique rafter that lies in a gutter", now called "valley rafter". **DORMAN TREE**.

"Sleeper in foundations", for supporting a superstructure; as timber laid on the heads of piling, and planked over. **GROUND-SILL** or plate. "Sleeper or stringpiece", forming the framework of a timber bridge by carrying the cross joists for the roadway. *MAHAN, Civil Engineering*, 4to., Edinb., 1845, p. 93.

SLEEPING ROOM. **ERGASTULUM**. **DORMITORY**. **BEDROOM**. **WARD**. The Poor Law Board recommend that the space given to each casual in a ward should be 2 ft. 3 in. At one work-house in 1864, 1 ft. 9 in. was considered sufficient. 600 cubic feet per man is now recommended for English barracks, and 1,200 for hospitals. In the metropolitan hospitals the average cubic space is 1,434 ft.; the largest being 1,560 ft.; the smallest 800 ft. 3,000 cubic feet per head per hour is computed to be necessary for the maintenance of the normal purity of the air.

SLEFORD (**WILLIAM DE**), clerk and supervisor of the king's works within the palace at Westminster and the tower of London, succeeding W. de **LAMBETH**, from 1361, 35 Edward III to at least 29 March 1369, 44 Edward III. He was one of the king's chaplains, and a prebendary of S. Stephen's chapel or college, of which he was dean 17 May 1369-77, and his name appears also as dean in 1383 and 1394. He was paid £18 4s. 0d. per ann. as clerk of the works. **BRAYLEY AND BRITTON, Palace at Westminster**, 8vo., 1836, p. 149, 186, 198, 245-6, 430; **DEVON, Brantingham Roll**, 4to., 1835, gives eleven later references.

SLID. In Loughton woodland were trees of such a character that 34 of them would yield a slid of 13 faggots every year. There was great value in the faggots there. Some confusion existed between green and dry, in season and out of season, the clearings, and the different slids and size of faggots. Thirty-four pollards produced a slid, and an average slid produced 13 faggots, or about $7\frac{1}{2}$ slids to a hundred faggots, or say 250 pollards to 100 faggots.

SLIDE or **SLIDING RULE**. A rule for the computation of timber, and useful for measuring artificer's work. The division of the line is formed from a consideration that 1,728 in. make a solid foot. Oughtred is said to be the inventor (ATHENÆUM, Oct. 18, 1862, p. 489, 593-4; also Coggeshall. A new rule by C. Hoare, 1855 (BUILDER *Journal*, xiii, 336); and HOARE, *The Slide Rule*, etc., 8vo., 1868. BAYLEY, *Handbook of the Double Slide Rule*, etc., 12mo., 1861. G. O. LUCAS, *The Slide Rule*, etc., 1828; B. J., 1864, xxii, 458. NICHOLSON, *Diet. of Arch.* 1.

SLIDING DOOR. Openings between rooms are sometimes arranged so that two or more may form a suite. If mounted on rollers at the bottom it makes a track across a carpet; or a groove in the floor is fitted with a brass cover. When suspended from a rail concealed above the head of the door, the soffit requires to be closed, as do the two sides, by a flap. An ingenious method of effecting this by one operation, by J. Sperring, was premiated at the Society of Arts, 1837, *Transactions*, li, pt. ii, p. 59, it having been applied with success at Uxbridge house, Burlington gardens. Sliding doors are noticed in NICHOLSON, *Builder's Companion*, 8vo., London, 1826, p. 235; not in *Carpenter's New Guide*, 1801. The large sliding gates of the engine house at the London and Birmingham railway, designed by Dockray, C.E., are given in DALY, *Revue Générale*, 4to., Paris, 1844, iv, 117, pl. 6. Sliding doors of iron are now fixed on each side of an opening in a party wall, when two buildings communicate. They require to be carefully made, and also fitted to prevent the passage of smoke, steam, and fire. 1878 Hatfield's patent rollers by A. Kenrick and Sons, West Bromwich. Clark, Bunnett, and Co.'s fireproof doors. 1884 Hobbs, Hart, and Co. improved fireproof doors, with clutch rebates. WHITE, *Fireproof Closing of Openings in Party Walls*, read at INST. OF BRIT. ARCHITECTS, *Proceedings*, 1884-5, p. 96. Bullivant's patent air-proof and noiseless sliding sashes.

SLIDING OF MATERIALS; see ARCH; FRICTION. Sliding and revolving ventilator; see HIT AND MISS ventilator.

SLIP. A shaving; also a thin and small piece of wood.

SLIPE; see SLYPE.

SLIPPER. The same as PLINTH. 4.

SLIP SOLE. The term in some parts of Scotland for a step.

SLIP WINDOW; see HIT AND MISS.

SLIT DEAL. A name for $1\frac{1}{2}$ in. deal cut into two leaves or made into two boards. "1651 Item paid . . . for lynning the shields (that contain the arms of the commonwealth of England) with slit deale and for putting staples in them, £0 4s. 6d." NICHOLS, *Manners*, etc., in *England*; Accounts of S. Margaret's, Westminster, 4to., London, 1797, p. 59. NEVE, *Builder's Diet.*, 1735, s. v. Batten door, says one inch thick. 1. 2.

SLITTS. A term used 1607 "to a joyner for a greate case-ment for one of the longe slits, 3s. 4d.", stated to refer to the "five sisters" in the north transept; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., 1859, p. 119, 353.

SLOANE (C.....), 1746 designed the gaol at Maidstone in Kent; 1731-3 contracted to complete after the fire the church of S. George at Gravesend; and 1764 built the new town hall. GENTLEMAN'S MAGAZINE, lxxix, 813. W. H. IRELAND, *Kent*, 8vo., 1830, iv, 287.

SLOB LAND. A term used in Ireland for what in England is called "foreshore"; the natural sediment of a river; "salt-ings" is where land thus formed is liable to occasional flooding.

SLOP. Liquid mud and street sweepings, which have to be carted away from the roads of a town. The foul water of a domestic habitation, the clearing away of which has introduced several inventions. Hillier and Dent's slop sink for housemaids. Conolly and Co.'s slop sink and combined lavatory, the former having a self-acting flushing arrangement, whereby when the slopes are emptied the closet must be flushed afterwards. Williams and Ferguson's housemaid's slate sink. Doulton and Co.'s Lambeth patent combination closet, comprising the closet, slop sink, and urinal by turning up a hinged seat. Jennings'

improved water-closet apparatus, combination urinal and slop sink, with hinged seat.

SLOPE of a cutting; see Angle of REPOSE. Of an embankment; see EARTHWORK.

SLOPE OF A ROAD; consists of acclivity and declivity. Besides the list given s. v. GRADIENT, see BUILDER *Journal*, 21 Nov. 1863, p. 818. INSTITUTION OF CIVIL ENGINEERS, *Minutes*, i, 49 (also ii, 71).

A pathway leads to the top of the tower of S. Marco; EVELYN, *Diary*, under 1645. Slopes instead of steps occur at Jeypore. CORDONATA. STAIRCASE. ORIENTATION.

SLOPE OF A ROOF; see DRIP; FALL; FLAT; PITCH. A slope or fall of 1 in 80 is found sufficient for all purposes of drainage of flats. The usual fall for a drain from a house is 2 to 3 in. or even 6 in. in 10 feet.

SLOT. 1485 "seris, clavibus, les tyers et slotes pro eisdem altaribus"; 1537 "banddes, slottes, barres, and staples to the new church and the offices, twoo lokes, ij keyes, iiij genoures, ij slottes." SURTEES SOCIETY, *York Fabric Rolls*, 8vo., 1859, p. 87, 109, 353. A sort of groove.

SLOTTING MACHINE. A machine for "dovetailing, grooving, slotting, and rabbitting", was patented about 1856 by John Whines of London, and by others later. An upright "key-grooving or slotting machine" is given in BUCHANAN, *Millwork*, 8vo., London, 1841, pl. 34.

SLOW COMBUSTION STOVE. This was the invention of Dr. Niell Arnott. The name was given from about 1870 to a fire grate to which only a moderate amount of air has access under the fire; in one case, "the builder's fire", the bottom of the grate is made solid. These grates usually have freclay lumps at sides and back. Pierce's firelump grates were the precursors of these now numerous inventions.

SLUDGE PIT. A cesspool.

SLYPE or "slypp", as in W. de WORCESTRE, *Itin.*, by J. NASMITH, 8vo., Oxf., 1778, p. 192, 225. The *Slype* was a narrow passage between the transept and the chapter-house, which occurs in the Benedictine houses of Winchester; Gloucester; Exeter; Durham; Finchale; and S. Alban's (where it is commonly given to the cloisters), and led to the monks' cemetery. Its place is supplied by the *Sacristy* in Cistercian houses. It occurs in the Clugniac convent of Bromholme, and in that of Austin Canons at Newstead. At New college, Oxford, it is the passage between the backs of the houses and the city walls, as shown in COCKERELL, *William of Wykeham*, in ARCHÆOLOGICAL *Journal*, 1850. "On the east side of the great cloister was a narrow apartment termed *slype* and *sacristy*; it contained the robes, hangings, etc."; TROLLOPE, *Monastic Arrangements*, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1862, p. 189. 19.

SMALL CUT BRAD; Glaziers; see BRAD.

SMALL-POX HOSPITAL. A building set apart for this malady. The one in London was established about 1745 in Windmill street; that at S. Pancras opened March 1767; taken down 1851 for the Great Northern railway; and a new building erected 1848-9 on Highgate hill by S. W. Dankes; BUILDER *Journal*, vi, 535, 547. In Nov. 1878 occurred the long trial of Hill and others, v. the manager of the Metropolitan Asylums Board, respecting the hospital at Hampstead. HOSPITAL.

SMALT. A blue colour, prepared from the arsenico-sulphuret of cobalt. The ore is roasted to drive off the arsenical fumes; then mixed with pure silex and carbonate of potash, and fused till it fluxes into a "blue glass" of different degrees of purity, the best of which when in lumps is called "*Smalt*" (and oil smalt); or when in powder "*azure*", and the worst "*Speiss*". From these are obtained all the different sorts of factitious ultramarine, and the famous *French blue*; with Dumont's blue, eschel, glass blue, Hungary blue, powder blue (common starch blue), royal blue, Saxon blue, stone blue, artificial and dutch ultramarine, zaffer. COBALT. The "oil smalt" may be laid in oil but it bears an indifferent body and is troublesome to work." 4. 9.

SMEATON (JOHN), born 28 May 1724 at Austhorpe, near Leeds, Yorkshire, showed early great aptitude for mechanism, and became the father of the new profession of civil engineering in Britain. In 1742 he went to London to study for the legal profession; 1750 commenced business as mathematical instrument maker; and 1756 Aug. 5 to 1759 Oct. 9, designed and carried out Edystone lighthouse, recording all his difficulties, etc., in *An Account, etc.*, fol., London, 1791: 2nd edit. 1793; *An Account abridged*, 8vo., Plym., 1824; also by E. P. EDWARDS, 8vo., 1882. In 1760 he competed, and was one of the eleven first selected, for the bridge at Blackfriars over the river Thames; about which he published 1760 a pamphlet. 1763 designed the bridge at Coldstream over the river Tweed, of five circular arches, the largest span being 61 ft.: 1764-77 was appointed receiver of the Greenwich hospital estates, which he vastly improved: 1766 or 1768-70 designed the bridge at Perth over the river Tay, of nine arches, 75 ft. span (MYLNE): 1767 the bridge at Hexham over the river Tyne, of nine arches, 52 ft. span: new lighthouses at Spurn head on the river Humber; and other engineering works including 1774-91 the pier and harbour at Ramsgate, and published *Historical Account*, 8vo., 1791. He died near Leeds 28th Oct. 1792, aged 67. Sale of books, 1794. Portrait presented 1841 by A. Burges to the Institution of Civil Engineers, London. PARKER, "Collections in Popular Literature", *Life*, 1845; and in *BUILDER Journal*, 1845, iii, 111-2; MUDIE, *Surveyor, Engineer, etc.*, 4to., 1842, iii, 85. *Reports, and Some Account of his Life, etc.*, 4to., 1812-4.

SMEDLEY QUARRY, with that at Collyhurst, both situated near Manchester, supplied the red sandstone used at Manchester cathedral in the xv cent., but it is now practically rebuilt (1886). They are both soft, and contain a large amount of clay and peroxide of iron. This stone has been disused for some years being of small value. *BUILDER Journal*, 1860, xviii, 27; iii, 547.

SMELTING; see CAST IRON; CASTING; and IRON.

SMERALDI (FRANCESCO), 1596 designed the exterior of the large cathedral church of S. Pietro di Castello, at Venice, in imitation of a design by Palladio; (interior renewed 1621 by G. Grapiglia); and designed many houses and palaces. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 319. WOODS, *Letters*, 4to., Lond., 1828, i, 274. CARLEVARI, *Fabbriche*, obl. fol., Ven., 1703. 68.

SMID (MICHAEL MATTHIAS), born 1626 in Rotterdam, rebuilt 1663-6 the tower of S. Mary's church at Berlin, 272 ft. high; 20 ft. more being added 1790 by Langhans. He died 1693. J. A. Nehring of Berlin was a pupil. 68.

SMILIS. One of the most ancient artists of Greece, son of Euclides of Aegina, supposed contemporary with Daedalus, but also said to have flourished about 100 years after the fall of Troy. He was a sculptor, and PLINY 36, xiii, 19, speaks of the LABYRINTH at Lemnos as by Smilis, Rhodus, and Theodorus, possibly meaning Smilis and Rhocus, and that Smilis commenced it and the others completed it 200 years afterwards. SILLIG, *Artists*, 8vo., 1836, p. 120. 3. 68. 78.

SMINTHIUM. Temple of Apollo Smintheus, now near the Turkish village of Kulagli, was situated in the district of Hamaxitos, an old town of the Troad, which helped to people the new city founded about B.C. 310 by Antigonos and augmented by Lysimachos, who changed the name from Antigoneia to Alexandria. The ruins were discovered by SPARR in 1853, during his survey of the coast for the Admiralty, and are further described in SOCIETY OF DILETTANTI, *Antiquities*, iv, 1881, ch. 3. The worship may be traced to Tenedos, Hamaxitos in Aegolis, in Rhodes, Crete, Sicily, and Tenea near Corinth. STRABO says, xiii, 604, there was a figure of a mouse at the foot of the statue, both being the work of Scopas of Paros.

SMIRIGLIO (MARIANO), of Palermo, architect to the senate of that city designed, among the public works, in 1630 the arches of the arsenal; 1567-90 the mole, the interior of the church del Carmine maggiore; the fountains in the strada di Mezzomonteale; 1630 assisted G. B. Livolsi of Nicosia in

the design for the bronze statue of Charles V, in the piazza de' Bologni; 1661 the marble enclosure of the statue of Philip IV, in piazza reale now della Vittoria I by G. P. Novelli; and other works. He died 17 September 1636, at an advanced age, and was buried in the church "del Soccorso" in the strada nuova in that city. GALLO, *Elogio Storico di P. Novelli*, 4to., Palermo, 1830, p. 10.

SMIRKE (sir ROBERT), R.A., F.S.A., Hon. Fellow R.I.B.A., born 1781, eldest son of the artist Robert Smirke, R.A.; went 1796 into the office of sir John Soane, R.A., where he was only for a year, and became a pupil of ... Bush, surveyor; and 1796 student at the royal academy, obtaining 1797 a medal for a design at the society of arts, and Dec. 1799 the gold medal of the academy. He made the drawings for LYONS, *Roman Temples, etc.*, at Bath, fol., 1802; and from 1801 to early in 1805 travelled to Paris, Rome, Naples, Athens, and Sicily, on his return publishing *Specimens of Continental Architecture*, 8 pl., 1806, which work only refers to Naples, Genoa, and Vienna. His early works, as 1808 Lowther castle, Cumberland, were in the mediæval style, but he chiefly practised the Greek style as 1808 Covent Garden theatre. In 1807 he was appointed architect to the board of trade; 1813 one of the three attached architects at the board of works; and when in 1832 it was broken up he was knighted. He was treasurer of the royal academy from 1820 to 1850. On 4 April 1853 he received the royal gold medal of the Institute of Architects. He retired 1845 to his residence at Stanmore, and died 18 April 1867, aged 87. Concrete was habitually and systematically used by him; and to some extent cast iron in girders; construction in iron, as cast-iron braces with wrought-iron ties and uprights was adopted by him early in XIX cent. He initiated the employment of two surveyors for taking out quantities in making estimates. When he became fully employed he declined commissions say under £10,000. Amongst his many pupils were his younger brother Sydney Smirke, W. Burn, L. Vulliamy, C. R. Cockerell, H. Roberts, J. Kay, C. C. Nelson. Various surviving pupils presented him in 1845 with a bust of himself by Campbell; a cast is in the library of the Institute. *Memoir* by sir EDWARD SMIRKE, F.S.A. (died 4 March 1875, aged 79), read at R.I.B.A., *Sessional Papers*, June 17, 1867; reprinted in *BUILDER Journal*, xxv, 604; and *BUILDING NEWS Journal*, xiv, 567-8. In 1817 he obtained the first prize for the "navy memorial" in the grand national monuments competition, GENTLEMAN'S MAGAZINE, 1817, i, 624. 1834 submitted a design for the new houses of parliament. 68.

Lowther castle, Westmoreland (mediæval), 1808-10 (BRITTON, *Tudington*, 1840, p. 23; FISHER, *Views*; NEALE, *Seats*, v).
Eastnor castle, Herefordshire (mediæval), after 1806 (NEALE, ii).
Kenmount castle, Dumfriesshire, before 1819 (NEALE, vi).
Strathallan castle, Perthshire.
Erskine house, Renfrewshire, picture gallery.
Luton park, Bedfordshire (burnt).
Priory at Stanmore, enlarged.
Newton Don, N.B.
Cardiff castle, Glamorganshire, various works.
Villa, Putney hill, for Lady Guilford.
Rose hill, Robertsbridge, Sussex, for J. Fuller, esq.
Sedbury park, Chipstow, Gloucestershire, various works.
Whittingham house, N.B.
Hardwicke court, Gloucestershire.
Stourton castle, Stourbridge, various works.
Nuneham park, Oxfordshire.
Bowood park, Wiltshire.
Clumber park, Nottinghamshire.
Belton park, Lincolnshire.
Cirencester, Gloucestershire, for earl Bathurst.
Powys castle, Montgomeryshire. Repairs, etc., 1828 (NEALE, Ser. 2, v).
Wilton castle, Yorkshire (NEALE, Ser. 2, iv).
Drayton manor, Tamworth, Staffordshire.
Stafford house, S. James's, London, additions.
Mansion in Halkin street, for earl of Oxford.
Mansion in Portman square, for earl Mansers.
Mansion in Belgrave square, for earl Brownlow.
Mansion in Piccadilly, for marquis of Hertford (rebuilt).
Mansions in Carlton gardens, for J. W. Croker, esq.; and for H. Baring, esq.
Mansion in Whitehall gardens, for sir R. Peel, bart.
Mansion in Berkeley square, additions for earl Powys.
Lansdowne house, Berkeley square, the Gallery.

Walberton house, Sussex.

Haffield house, near Leobury.

Normanbury park, Lincolnshire.

Stillingthorpe, Leicestershire.

Edmond castle, Cumberland.

Eden hall, Cumberland.

Kinfauns castle, Perthshire, 1820-2

(NEALE, Ser. 2, iv).

Oulton house, near Leeds.

S. Mary's and Schools, Bryanston square, 1823-4.

S. Anne's, Wandsworth, Surrey, 1820-2.

S. John's, Chatham, Kent.

S. Nicholas, Strood, Kent.

S. George's, Tildesley, Lancashire.

S. George's, Brandon hill, Bristol, 1823.

S. Philip's, Salford, Manchester, 1825.

S., Netherton, Worcestershire.

S., or West Hackney, 1823-4.

S., Ashham, Lowther park, Cumberland.

Royal Mint, Tower hill, 1800-11, considerable portion and entrance; and interior after fire 1815.

General post-office, S. Martin's-le-Grand (East side), 1824-9 (BRITTON AND PUGH, *Public Edifices*, Suppl. by LEEDS, 1838).

General penitentiary, Millbank; 1816-7 repairs of portions and entrance (CONCRETE; BUILDER *J.*, 1868, xxvi, 181).

British museum, 1825-8 East wing; King's library 300 x 11 x 30, and renovated 1844; South front completed 1847.

Custom house, central portion and underpinning of the whole, 1825-26 (FAGUS).

College of Physicians, Trafalgar square, 1824-5 (BRITTON, *etc.*, *Public Edif.*, ii).

King's college, Strand, forming east wing of Somerset house, 1830-1.

Legacy duty office, in Somerset house.

Bodleian library, Oxford, various restorations.

Union club house, Trafalgar square (partly altered), 1824-7 (BRITTON, *etc.*, *Public Edif.*, ii).

Carlton club house, Pall Mall; 1835-6 (rebuilt 1847 and 1854 by S. Smirke).

United (now Junior United) Service

1823-6 County Courts at Lincoln, 1823-6; at Carlisle 1810-11; Gloucester.

Shire hall, Hereford, 1817-9; at Perth, a fine room for music; at

1812-5 Eden bridge at Carlisle (fell down, BUILDER *Journal*, xxi, 205a). CRESSY, *Bridges*; and 1814-6 Westgate bridge at Gloucester, one arch 87 ft. span.

1808-9 Covent garden theatre, in ten months (BRITTON, *etc.*, *Public Edif.*, 1825, i); burnt and rebuilt 1857-8.

Ledbury almshouses, Herefordshire. Cheltenham, Gloucestershire, the bazaar.

Whitehaven assembly rooms, Cumberland.

Rectory houses of S. Magnus and of S. Mary Woolnoth, London bridge.

Equitable Assurance company

Armley house, Yorkshire; before 1821 (NEALE, v).

The Grange, Hampshire; altar and addit.

Offley place, Herts (ACKERMANN, *Repository*, 1827, 3rd Ser., ix, 188; NEALE, 2nd Ser., v).

Worthy house, Hampshire; before 1824 (*idem*, 1825, 3rd Ser., vi, 312).

S., Markham Clinton, Notts (ILLUSTR. LONDON NEWS, 1851, xviii, 62).

S., West Markham and mausoleum, Clumber park, Notts.

York minster, restoration of choir after fire of 1828.

Chapel royal, S. James's, interior fittings; 1837.

Whitehall, chapel royal, interior restored and refitted; 1837.

Belgrave chapel, Belgrave square, *cir.* 1825.

Chapel, Chapel street, Grosvenor place, 1825.

club house, Regent street, before 1822 (ACKERMANN, *Repository*, Ser. 2, xiii, 116; rebuilt 1855-7 by T. M. Nelson).

Oxford and Cambridge club house, Pall Mall (jointly with S. Smirke) 1836-7; CIVIL ENG., *etc.*, i, 15 and 59.

Inner Temple. 1824 Library and adjacent chambers; Dining hall, interior; Harcourt buildings; 1814 King's bench walk, south end; 1819 Inner Temple hall (rebuilt by S. Smirke 1868-70); also restored south side of Temple church 1827-8; Paper buildings, north end; Tanfield court, south side; and Mitre court buildings.

Serjeants' Inn and Judge's chambers, Chancery lane; 1837-9.

S. Thomas's hospital, façades (partly pulled down)

Offices of the duchy of Lancaster and Lancaster place, Waterloo bridge.

The temporary Houses of Parliament after the fire of Oct. 1834.

Westminster hall, new facing 6 in. thick of Huddlestone stone to the interior, 1835-6.

Oxford, Sheldonian theatre, restored and cupola erected, 1838.

Dublin, the Wellington monument, Phoenix park, unfinished, 1817.

Shrewsbury; at Maidstone and completion of the county gaol.

Council house, *etc.*, Bristol; and *cir.* 1831, gaol at S. John's, Newfoundland.

offices, Bridge street, Blackfriars, 1829.

Ophthalmic hospital, Moorfields. Mansion house, alterations of steps to front portico, 1836.

Strand buildings adjoining Exeter hall; 1830-1.

Façades to the North and South approaches to London bridge, to King William street, and to Moorgate street, Finsbury; 1824-30.

SMIRKE (SYDNEY), fifth son of the artist Robert Smirke, R.A.; born 1799; F.R.I.B.A., R.A., professor 1860; and treasurer 1862-7; and F.S.A.; became a pupil of his brother sir ROBERT SMIRKE, whom he greatly assisted until his retirement; 1819 received the gold medal of the royal academy; and travelled 1820 to Italy, Rome, and Sicily. In 1828 he succeeded T. F. Hunt as clerk of the works at S. James's palace, *etc.*, an office abolished 1832. His first works were at Oakley park, Eye, Suffolk, for sir Edward Kerrison, and Thornham hall, Suffolk, for lord Henniker; 1834-6 designed the Pantheon bazaar, Oxford street (now messrs. Gilbeys), retaining the north and east fronts of Jas. Wyatt's design; 1834 the custom-house at Bristol; *cir.* 1834 Gunnersbury park, Ealing (retaining the saloon 1663 by W. Webb), with stabling, *etc.*, for baroness Rothschild; 1836-7 with his brother, the Oxford and Cambridge club-house, Pall Mall; 1839-40 gained third premium in the competition for rebuilding the royal exchange; 1840-43 engaged on the restoration of the belfry, of south-west tower, nave, aisle, *etc.*, of York cathedral; and 1842 house at Knowsley, Lancashire, for R. Earle, esq. He succeeded his brother Robert as surveyor to the Inner Temple; and in 1841 with D. Burton acting for the Middle Temple proceeded with and completed the restoration of the Temple church which had been commenced by J. Savage. In 1848 he designed the south end of Paper buildings, having turrets at the angles; 1858 the west side of Inner Temple lane; 1863-4 Crown office row; 1868-70 the dining hall; 1842-3 new Exeter change arcade, Wellington street (plan in CIVIL ENGINEER, *etc.*, *Journal*, vii, 305); and Bielefeld's papier-mâché works opposite; 1843 the restoration of the Savoy chapel for queen Victoria; and 1860 the restoration after the fire. 1843-5 with G. Basevi, the Conservative club-house, S. James's street; Smirke undertaking the first-floor decorations and Basevi the ground-floor; 1843 to 1868 as architect from 1838 to Bethlehem hospital, Southwark, he added largely to J. Lewis's design; and 1844 the central dome, with the projecting parts of the east and west wings; 1852-3 greater part of the south wing, airing courts rearranged, new workshops, *etc.*, giving accommodation in 1868 for 376 patients. 1845 the portrait gallery at Drayton manor, for sir R. Peel, bart. (BUILDER *Journal*, iii, 217, 223); 1844-5 Halsall rectory, near Ormskirk; a burial aisle at Northiam church, Sussex, for the Frewen family; 1845-6 the money-order office, S. Martin's-le-Grand; 1847-57 at the British museum, including 1855-57 the circular reading-room, 140 ft. diam.; the Roman and Assyrian galleries; the Xanthian room; and 1851 the iron railing, *etc.*, next Great Russell street (CIVIL ENGINEER, *etc.*, *Journal*, xv, 41; xx, 136; BUILDER *Journal*, vii, 198; viii, 295 plan; xiii, 133; xv, 229; BUILDING NEWS *Journal*, iii, 153, 458); 1846-7 the assembly rooms, hotel, and atheneum, at Bury in Lancashire; 1847 and 1854 enlarged and rebuilt the Carlton club-house, Pall Mall, introducing polished red granite columns in the façade (COMPANION TO ALMANACK, 1848, p. 237; BUILDER *Journal*, v, 219; xiii, 331; CIVIL ENGINEER, *etc.*, *Journal*, x, 297); about 1850 the Juvenile reformatory at Parkhurst, Isle of Wight; laid out lord Radnor's estate at Folkestone and designed a small church; 1852-4 the mansions of C. de Murrieta, and of Au. de Arroyave, in Kensington palace gardens; 1853-7 restorations at Lichfield cathedral (since again restored); 1860 the Italian arcades of the Horticultural gardens, at South Kensington (B. *J.*, xvii, 457); 1863-4 the piazza of the Radcliffe library, Oxford, enclosed and fitted for books; and 1867-70 the new galleries of the royal academy at Burlington house, Piccadilly: on the completion of which he retired from practice. As surveyor to Bridewell hospital, Blackfriars, he executed various works 1829-64; was also surveyor-general to the duchy of Lancaster; and architect to Woking cemetery. Amongst other executed designs are the custom-houses at Gloucester and Newcastle; mansions at Oakley park; Deysbrook; at Clumber park; 1847 Barley Thorpe; at Luton Hoo; at Knowsley for earl Derby; the Rocks at Uckfield; a large house for Frederick Peel, esq.

Among his pupils were Frederick Diaper of New York, U.S.A.; Sancton Wood; Frederick Barnes of Ipswich; W. A. Boulnois; E. H. Martineau; J. M. Lockyer; H. R. Newton; Arthur Cates; F. T. Gompertz; A. H. Parken; R. Hutchinson; and Sydney one of his sons. In 1860 the Royal gold medal of the Royal Institute of Brit. Architects was awarded to him; and he established 1852 the architects' benevolent society, of which he was the active president from its commencement until his death 8th December 1877, aged 78, at Tunbridge Wells.

He contributed essays to the *ARCHÆOLOGIA*, 1826, xxi; 1830, xxiii; 1833, xxv; 1836, xxvi and xxvii: published *Suggestions for the Architectural Improvement of the Western Part of London*, 8vo., 1834; 1836; read *Papers* at the Royal Institute of British Architects, 1847; 1849; 1850; 1853; 1858; 1860; and the *Professional Life of C. R. Cockrell*, 1863. His lectures as professor at the royal academy are given in *BUILDER Journal*, xviii, 1860, p. 65; and each year to 1866. Lecture at Architectural Exhibition "On the Use of Colour in Architecture"; wrote *The Temple Church*, in Weale's *QUARTERLY PAPERS ON ARCHITECTURE*, 4to., 1843-5: supplied the drawings for eleven plates of sections of "Roofs" chiefly foreign, for *TREDGOLD, Carpentry*, 4th edit., by Barlow, 4to. (Weale), 1853: wrote *A Mode of Assisting the Eye in the Right Perception of Colour in Pictures*, 8vo. (1856, priv. printed); and *Remarks on some London Relics*, in *Trans. of London and Middlesex Archaeological Society*, i, pt. 1. *Memoir, etc.*, in *BUILDER Journal*, 1877, xxxv, 1256. *BUILDING NEWS Journal*, xxxiii, 583; and *ARCHITECT Journal*, 1877.

SMIT (JAN), designed 1768-71 and executed the extensive diaconielhuis, or orphan house, at Haarlem. He flourished 1820 at Amsterdam. KONING, *Pictures of H.* 24. 68.

SMITH (.....); see JOHN SANDERSON. See SMYTH.

SMITH (CHARLES HARRIOTT), born 1 Feb. 1792, was chiefly a sculptor; at twelve years of age he worked under his father; 1814 entered the royal academy, passed through all the schools; 1817 gained the gold medal for architecture; exhibited 1809-24, and later; 1838-9, was appointed one of the four commissioners to search for a fit and proper stone for the new houses of Parliament, a collection of the specimens of which he presented to the Institute of British Architects; *Report of the Commission*, fol., 1839; reprinted 1845; and in *GWILT, Encycl. of Architecture*. He died 27 Oct. 1864, aged 72. *BUILDER Journal*, xxii, 802; to which publication he contributed many articles, and others, s. v. Catalogue of library of the Institute.

SMITH (.....), lieutenant-colonel, designed 1820 the fine tower of the (burnt) church of S. Nicholas, at Copenhagen.

SMITH (GEORGE), was 1723 appointed clerk of the (London) city works succeeding Olly; he was dismissed 1733 and was succeeded by George Dance.

SMITH (GEORGE), F.R.I.B.A.; F.S.A.; was born 28 September 1783 at Aldenham, Hertfordshire. Articled by his grandfather 11 Oct. 1797 to R. F. Brettingham, he left him in 1802, was clerk to James Wyatt, D. Alexander, and to C. Beazley. He was appointed 1810 District surveyor of the southern division of the city of London, and 1814 surveyor to the Mercers' company, both appointments he held until his death; and the surveyorship to the Coopers' company, this he resigned and twice served the office of master. He designed before 1808 the Wesleyan chapel in Jewin street; 1820-5 the new stone tower and entrance to the royal exchange in place of the timber one, repairing the stone work and sculpture of the whole building, adding three large stone staircases, at a cost of £33,000 (BRITTON AND PUGIN, *Public Edifices, etc.*, 8vo., 1825, i, 292; PAPWORTH, *Select Views*, 8vo., 1816; WEALE, *Pict. Handbook*, 1851, p. 368: it was burnt 10 Jan. 1838); 1821-2 S. Peter and S. Paul church, Mitcham (BRAYLEY, *Survey*, 1841, iv, 92; CRACKLOW, *Churches in Surrey*, 4to., 1823); 1822 Whitlington almshouses, Highgate archway road; 1823 S. Paul's schools, S. Paul's churchyard (pulled down 1885); Hornsey church, except the tower; church of S. Michael and All Angels in Blackheath park (IRELAND, *Kent*, 1828-30, iv, 726); 1827-8 new or London corn

exchange, Mark lane, with A. B. Clayton; about 1830 Mercers' school, College hill; 1836 hall of the Crown and Sceptre tavern, Greenwich, with W. Barnes; 1838 S. Thomas church, Arbour street west, Mile End, with W. Barnes (who was in partnership from 1836 to 1842 with him and died May 1868); 1840-1 the grammar school at Horsham, Sussex; 1840 S. George's Wesleyan chapel, Back road, S. George's in the East; and also 1841-2 Kilrea church; Woodbaswick hall, Norfolk, for ... Cater; the town hall and court house at S. Alban's, Hertfordshire; 1842-3 Gresham college, Basinghall street; 1843-4 the first railway station at London bridge with H. Roberts; 1848-9 Christ church schools, Johnson street, Mile End (the church was by J. Shaw); and his own residences, "Newlands" at Copherne, Sussex, and "Brooklands", Blackheath park, now occupied by Dr. Kidd. From 1807 he was a member of the Surveyors' club; and 1843-4 chairman of the select committee on "Dilapidations", whose report was issued by the Royal Institute of British Architects. He was surveyor to the trustees of Morden college, Blackheath, and in late years with G. B. Williams as partner. Among his pupils were Dr. H. C. Barlow; W. Barnes; W. Grellier; James Barr; David Brandon; Geo. Barnes Williams; and Geo. Low; T. Nichols and A. B. Clayton were assistants. He died 5 Jan. 1869. *BUILDER Journal*, xxvii, 42, 65, 92.

SMITH (JAMES), of Warwick, built *cir.* 1700 the court house after the fire of 1694; and the nave and tower of S. Mary's church, then also burnt (attributed to sir C. Wren and to sir W. Wilson); WALPOLE, *Anec.*, by Dallaway, iii, 287, says Francis Smith, quoting NOBLE, cont. of Grainger, iii, 392; Four Oaks hall, Warwickshire, for S. Luttrell, lord Irnham, later sir E. C. Hartopp, bart. (NEALE, *Seats*, 1822, i); Stoneleigh abbey for Edward lord Leigh, with perhaps 1714, the good bridge over the river Avon, for J. H. Leigh, esq.; and Ditchley park, Oxfordshire (1720 by J. Gibbs; NEALE, *Seats*, 1822, v).

SMITH (JAMES), "the most experienced architect in Scotland", as stated by CAMPBELL, *Vitruvius Britannicus*, fol., 1715, ii, pl. 50, giving 1692 Melvin house, Fifeshire, for earl of Leven and Melville (also referred to in BREWSTER, *Edinburgh Encyc.*, s. v. Civil Architecture). ADAM, *Vit. Scoticus*, fol., 1720-40, gives his name on pl. 8, to the court front of Hamilton house (not palace), co. Clydale, for the duke of Hamilton; pl. 22-3, Dalkeith house for the duchess of Buccleugh; and pl. 25-30, Yester house, East Lothian, for the marquess of Tweeddale, with A. MacGill to the north front; and Craigend is attributed to him.

SMITH (JOHN), of Dublin, designed 1758-62 S. Thomas church, Marlborough street, Dublin, after a Palladian design. 1760-9 S. Catharine's church, over £7,000; 1761-8 the circular lighthouse at the end of the south wall or pier of the harbour; and designed several other public buildings in that city, besides 1771 the tomb to Archd. A. Smyth in S. Patrick's cathedral, carved by van Nost, £1,500. MALTON, *Dublin*, fol., 1701-92-5. POOL AND CASH, *Views*, 4to., Dubl., 1780; p. 94, 97. WARBURTON, *Dublin*, 4to., 1818, i, 436, 501, 504.

SMITH (JOHN), born 1781 in Aberdeen. About 1805 he commenced with "planning and executing" a house for Peter Milne of Crimonmogate (now occupied by sir Alex. Baunerman, bart.); was appointed city architect and superintendent of public works, which he held until his death. Completed and published 1810 the first correct survey of the city; designed 1830 the north, south, and S. Clement churches; façade in front of S. Nicholas churchyard; 1820 court house; tomb to Dr. Hamilton; 1828-9 Gordon's hospital extension; 1841 public schools in Belmont street; Advocates' hall; new front of the Tolbooth; 1828-31 east prison; 1841 extension of the bridge of Dee; additions to King's college; record office in King street; 1847 Trades hall by J. and W. Smith; and 1842-3 by A. Simpson and J. Smith towards the end. Many residences in the city and vicinity; Slains castle; extensive additions to Haddo house; and Balmoral, now the residence of queen Victoria; with many churches and manse throughout the country. Thomas

Mackenzie of Elgin studied under him; A. Ellis was a pupil. He died ... July or August 1852; aged 71. *BUILDER Journal*, 1852, x, 506.

SMITH (ROBERT), with Richard Maude and Hugh Daives, all of Oxford, freemasons, were 1631-35 the contractors for the erection of the new buildings at S. John's college, Oxford, from the design of Inigo Jones; GOULD, *History of Freemasonry*, 4to., London, 1884, iii, 150. He is very probably the same "Smith" whose christian name has not been yet given, who executed 1630-40 the fine Gothic staircase with vaulting, at Christ Church college, Oxford, for dean Samuel Fell; he is called "an artificer of London" by Peshell, quoted in INGRAM, *Memorials*, 4to., 1837. JEWITT, *On the Late Gothic Buildings of Oxford*, in *ARCHAEOLOGICAL Journal*, 1851, viii, 393. It is highly praised by FREEMAN, *Hist. of Architecture*, 8vo., 1849, p. 438.

SMITH (SAMUEL POUNTNEY), of Shrewsbury, forty years of practice, and 1873 served the office of mayor. He died there Nov. 1883.

SMITH (THOMAS), born 1799, held the office from 1832 of surveyor to the county of Hertford, where he reconstructed the gaol, lunatic asylum, and many smaller buildings and bridges. He also held for several years a similar appointment for Bedford. He was surveyor to the London estate of the marquis of Salisbury, and of baron Dimsdale. In Ireland he acted for the late lord Ranfurly, and sir Patrick Bellew; and designed the hospital at Louth. He 1849 designed Clophill church, Bedfordshire. With his son Thomas Taylor Smith, he designed at Nice the English hotel, and the English Protestant church, as also the churches at Cannes, Stuttgart, and 1862-4 at Naples (*BUILDER Journal*, xxi, 756, 773); also the château Ste. Ursule, at Cannes in the south of France, for lord Londesborough, under the direction of Pullham, clerk of the works; view in *BUILDING NEWS Journal*, 1859, v, 854, 863; with several other châteaux and villas, and a Gothic church. He served the office of mayor of Hertford in 1868. He died 1st Oct. 1875, aged 76. *BUILDER Journal* for 1875.

SMITH (WILLIAM JAMES). A relation and pupil of T. Cluwer of the Government office of woods and works. He probably wrote *Synopsis of the Origin and Progress of Architecture*, 8vo., 1831. He was sent to Constantinople to design 1845-8 the new palace there for the English ambassador (*BUILDER Journal*, v, 98); and where for the sultan Abdul Medjid (1849-18...) he designed the kiosks or palace in the sultan's gardens at Teheraghan on the Bosphorus; also another at Tophana facing the seraglio point (*BUILDER Journal*, xi, 607); the cavalry hospital at Geumush-souyou for 200 beds; the barracks on the grand champ des morts in Pera as a school of medicine; in the war of 1854 it served for 4,000 beds; the riding house and stable attached to the polytechnic school, the former 160 ft. by 70 ft. by 70 ft. to the apex of the roof; the theatre, its roof 70 ft. span; and the winter garden attached to the sultan's new palace at Dolma Baktché. About 1854 he returned to London, but not being reinstated in the office, he 1857 retired to Genoa, thence to Leghorn and Florence, where he died after 1874.

SMITH. A mechanick, usually called "blacksmith", who works in metal. BEDE (edit. before 1823), v, c. 14, and p. 634, describes a monk as well skilled in smithcraft. The "white-smith" works in pewter. Also a planisher, one who does not work at a forge.

SMITHING; SMITHERY. "An art manual, by which an irregular lump (or several lumps) of Iron is wrought into an intended shape". MOXON, *Mechanick Exercises*, 4to., London, 1677. This work describes the *forge*, *anvil*, small cistern, *longs*, pincers, *hammer*, and *sledge*, vice, hand-vice, plyers, drill and drill bow, screw plate and taps, punches, files, brazing and soldering, hinges, locks and keys, rivetting, screws and nuts, jacks, case hardening, and steel: the grindstone, and the chisel, very short and held by a twisted osier or withy, like swages, and is double basilled. A list of the things supplied to Rochester castle by a

smith 1368-9, is given in KENT ARCH. SOCIETY, *Arch. Cant.*, 8vo., London, 1859, ii, 125; and those in 1703-36, in NEVE, *Builder's Dict.* 1.

A SMITHY or smith's workshop is an economical addition to a large farm for there is always something to be done, and it is easier for the workman to go to it than for the implements to be removed. It is best isolated for fear of fire, although it is said a smithy or blacksmith's shop is never burnt. The roof of the smithy should overhang so as to form a shelter over horses being shod. The forge, its bellows, cistern, anvil, the hammers, pincers, and other tools, iron, etc., are all that are required. The letters patent, reciting the properties granted to Bartholomew's hospital by Henry VIII, specially mention a smithy in Giltspur street; the one in existence (January 1870) opposite Cock lane is probably the same property. The origin of the payment in tender of six horseshoes with the nails thereunto belonging, by the sheriffs of London and Middlesex, at the time of their being sworn into their office by the chief baron of the Exchequer, arose from the possession by the city of London of a piece of ground in the Strand, within the parish of S. Clement Danes, which they obtained by grant from Walter de Bruin, a farrier, who in 1235 purchased the same of the crown for the purpose of erecting a forge, on condition of paying the said number of shoes and nails annually into the Exchequer. 1.

SMITH'S ASHES. As obtained from a foundry and applied as protection from DRY-ROT; SOCIETY OF ARTS, *Transactions*, xii, 265. "Smith's leavings" ground and mixed with middling or hydraulic limes make good mortar for works out of water. Also a black mortar for repairing the joints in old walling. ASHES.

SMITHSON (ROBERT, HUNTINGDON, and JOHN); see SMYTHSON.

SMOKE. Unconsumed coal; unburnt carbon consisting of carburetted hydrogen, carbonic acid gas, and free carbon. The vapour arising from substances in a state of combustion. The emission of smoke is the effect and may be taken as the proof of imperfect combustion; it is therefore always attended with waste of fuel. SMOKE ABATEMENT EXHIBITION in London, 1882. *Effect of Smoke in the Destruction of Architecture*, *BUILDER Journal*, 1853, xi, 59; 84. *Injurious Effects of Smoke on certain Building Stones*, *idem*, 1864, xxii, 56. *Decay of Stone in Public Buildings*, *idem*, 1869, xxvii, 70, states that "smoke and dirt do not necessarily destroy good stone". SOOT. FUMIGATION. 14.

SMOKE AND ASH HOUSE. An erection, say 15 ft. by 12 ft. divided into two; one for the ashes derived from burning the wood in domestic operations—useful as a manure, for making potashes, etc.: the other for keeping beef, etc. By means of smoke easily raised by having a small open furnace in connection with the chamber, the meat is kept dry, etc., and free from flies. These are useful accessories to a country house in the American colonies. BURN, *Handbook of the Mechanical Arts*, 8vo., Edinb., 1860, 2nd edit., 319.

SMOKE CONDUCTOR; see CHIMNEY HOOD; FLUE; HOOD; PIPE.

SMOKE CONSUMING APPARATUS to a furnace. Most of the plans previous to 1847 had been tried by messrs. Truman and Co.; then came Jucke's patent furnace with marked success. *Information with regard to the Operations of Inventions*, elicited by the inquiries of the General Board of Health, July 20, 1854; digest in CIVIL ENGINEER, etc., *Journal*, 1855, xviii, 225; Grissell's patent smoke consumer, 1855; Gardner's patent process for consuming all smoke, *idem*, 422. *Heating Apparatus and Contrivances for the Prevention of Smoke Nuisance*, in the Exhibition of 1862, *BUILDER Journal*, xx, 670-2. Martin and Co.'s patent smoke consuming furnace doors, 1868. Annan's patent smoke consuming furnace-door and frame.

SMOKE EXTRACTOR, or chimney cowl; see COWL.

SMOKE FLUE OR PIPE. Experiments on the resistance of a flue or other thin tube to collapse, with important results, were laid before the Royal Society by Mr. Fairbairn, and given in PHILOSOPHICAL TRANSACTIONS for 1858; an abstract read

before the British Association; and in *BUILDER Journal*, 1858, xvi, 720. The smoke flue as used by the Romans for warming apartments, see BATHS, etc., Detached Essay: CALIDUCT; and HYPOCAUST. A combined smoke flue with air flue for the ventilation of rooms was made 1866 by Doulton in terra-cotta, 12 in. by 10 in. and 8 in. diameter. In metal they were made by Boyd. FLUE (p. 59). CHIMNEY.

SMOKE TOWER. A smoke shaft or stalk carried up within an enclosure which may be used for ventilation or heating purposes, or in which may be a staircase to a look-out place or applied to other purpose: as at Thomas Cubitt's workshop, Thames bank, 105 ft. high, 17 ft. square; *BUILDER Journal*, 1845, iii, 49, 62, 161. Fair Oak house, Isle of Wight, a central shaft heated by a furnace in the basement supplied warm air to all the rooms which had no fireplaces; plan, etc., in *BUILDER Journal*, 1860, xviii, 330. The smoke tower at the Crystal Palace at Sydenham. *Smoke Conduction at Osmaston Manor, idem*, 1851, p. 308; and ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 28 April 1851. STALK.

SMOKE VENT. A term used for the flue in early mediæval works, formed in the wall. They occur at Millom castle, Cumberland (*BUILDER Journal*, 1860, xviii, 629); at Rochester and Hedingham castles; and at a house at Winwall. Sometimes they have a pseudo chimney outside, as at the lavatory at Lincoln gate (*idem*, 712). AUBREY writes that "before the Reformation, ordinary men's houses, copyholders and the like, had no chimneys but flues like louvre holes: some of 'em were in being when I was a boy" (*idem*, 765). But TURNER AND PARKER, *Dom. Arch.*, 1853, ii, 88-9, state that in XIII cent. each room had a fireplace, as at S. Briavel's castle, Gloucestershire; and give several chimney pots. The hall at Mayfield has several "vents" formed over the windows and in the wall, perhaps for letting out the smoke from the hearth in the middle, or for ventilation. FENERALL. FUNNEL. FLUE.

SMOKING or SMOKY CHIMNEY. It frequently arises from deficiency of air in the room; a bad draught; or other chimneys on the same level at their outlet. These are cured by finding an inlet of fresh air in sufficient quantity to reverse the action in the flue and create a proper updraught. When the cause is the proximity of loftier buildings some device of shielding the outlet which will keep off the downpour of air or wind may be effective. The nuisance is at least as old as the time of LUCAS, *Solace*, 4to., London, 1590, who suggested bleeding the flue above the roof by two pipes on each side of it. NEVE, *Builder's Dictionary*, 1703, refers to this and other devices, and states that the smoking may be prevented by "the situation of the doors, an apt falling back of the back, and convenient gathering of the wings and breast of the chimney." RUMFORD before 1797 considered the immoderate size and bad construction of the throats of chimneys. There is no doubt that the following directions will cure a vast number of cases, irrespective of the stove or grate used in the opening, and that making the throat small will prevent others smoking; but the question is raised whether these smaller openings may not form a sort of blast, which carries more heat up the chimney. TELFORD prescribes a slow draught at bottom, no contraction there; but the inside of the flue contracted at the top in proportion to the size of the room, and according to a scale he lays down. It has been recommended to "find out the due proportion of the opening by the use of movable boards, which will be according to the height of the funnel, from 36 in. square and 18 in. deep in the lower rooms to 18 in. and not quite so deep in the upper; if the funnel be too short contract the opening or build it up higher; the intermediate ones diminishing in proportion as the height of the funnel diminished." In constructing flues, taking them up straight from the chimney back and reducing them to 9 in. diameter at the top for the last 6 ft. of the length, with proper divisions between the tops of the flues will probably ensure a freedom from smoke. The modern forms of slow combustion and similar grates in most cases effect cures. The

ARCH. PUB. SOC.

CHIMNEY LINTEL has been found very useful in building chimneys; and the same principle, by forming *convex* gatherings in contradistinction to the *concave* formerly in use, and carrying the flue up straight in the middle for the first 2 or 3 ft., was adopted by Pierce of Jermyn street for old chimneys with great success; CIVIL ENGINEER, etc., *Journal*, 1850, xiii, 334.

The following are among some of the many works on the subject: the article FLUE should be referred to. W. ROBINSON, *The Gentleman's and Builder's Director*, gives "directions to build chimnies to prevent their smoking", under the Act of Parliament 14 George III, passed 1773-4. ACKERMANN, *Repository of Arts, etc.*, 8vo., 1816, i, 135; 196. GREGSON, *Causes, Cure, and Prevention of S. C. in New and Old Buildings*, 8vo., 1818. *Causes and Cure of S. C.*, by "Tba", in *BUILDER Journal*, 1850, viii, 529, 578; ix, 3, 68, 212, and 243. Also viii, 142; 417, cure in 1580; and xxii, 282. *Report of the Aeronomic Association*, 8vo., 1852. EDWARDS, *Smoky Chimneys*, 8vo., 1866; 1869, 5th edit. FOSTER, *Cause and Cure of S. C.*, 8vo., 1885; and in *BRITISH ARCHITECT Journal*, 1885, July, p. 20-1. PASLEY, *On Captain Sandham's Mode of Curing, etc.*, in *ROYAL ENGINEERS, Papers*, 4to., London, 1st Ser., 1838, ii, 251-62. CHIMNEY. FLUE.

SMOKING HOUSE. A chamber from about 4 ft. to 10 ft. square, adapted for smoking fish, bacon, etc., having several iron bearers across overhead from which the articles are suspended. The fire-hole is sometimes outside in a pit for burning wood, sawdust, or peat, the smoke being led into the chamber itself and allowed to escape by easily regulated louvre boards in the roof. Large ones are generally made of fireproof construction, and erected outside the offices. Modern antique furniture is now so placed to obtain the appearance of age.

SMOKING ROOM. An apartment specially devoted to those who smoke tobacco. A "smoking room" is shown in the plan of Duff house, next the billiard room at the extreme end of the wing, in WOOLFE AND GANDON, *Vitruvius Britannicus*, fol., 1771, ii, pl. 58. Its position is sometimes at the top of the house in a species of prospect chamber; or on an upper floor to which a spacious balcony is attached for use in summer; or on the ground floor, detached, or well shut off from the main portion: if the latter, it should be easily accessible from the dining room. It is often attached to the billiard room. A fireplace should be provided and complete ventilation, having regard to the windows of apartments over and near those of the room itself; lounges and easy chairs; with a writing-table and perhaps small bookcase, are necessities, as the room should be adapted also for a chatting room. KERR, *Gentleman's House*, 8vo., 1871, 3rd edit., 129.

SMOLENSK. An ancient capital in middle Russia, situated on both sides of the river Dnieper, crossed by a timber bridge. A great part of the old walls 17 ft. 6 in. thick and 49 ft. high, with 17 out of 36 towers built 1596 still remain. The kremlin dates *cir.* 1485-90. A Byzantine memorial of cast iron was inaugurated Nov. 1841 in memory of the battles against the French in 1812. The cathedral of the Assumption, dating from 1101 was blown up in 1611, and rebuilt 1676. There are many other Russian churches, among which SS. Peter and Paul dates 1146; S. John Baptist 1160-81, but the additions have spoiled their interest; that of the archangel Michael dates from 1180, additions 1773, renovated 1812. Corn. le BRUN, *Voyage par la Moscovie, etc.*, fol., Amsterdam, 1718, i, 420-76. 14. 28. 50.

SMOOTHING PLANE. A plumber's tool used to smooth the sand in a mould for casting sheet lead. It is a thick plate of brass about 9 in. square, a little turned up on all the four edges. On the upper side is a brass handle on which is one of wood. In joiner's work, a plane of 6 or 7 in. in length used to smooth or finish the planing-work, the iron being set fine for that purpose. 1. 4. 14.

SMUDGE. The refuse of painter's paint and varnish pots all worked up together; it makes a good dark and hard paint which is useful where there is much traffic.

C C

SMYRNA. One of the most ancient Greek cities in Asia Minor. It is mentioned in VITRUVIUS. It was rebuilt on a new site perhaps by Alexander the great (PLINY; and PAUSANIAS), on the north bank of the river Meles. After a severe earthquake in 178 the city was restored by Marcus Aurelius, but very few traces remain of ancient buildings. The aqueduct is described in *Detached Essays*, p. 4; the amphitheatre, noticed in STUART, *Athens*, Supp. vol., 1830, p. 35 note; and the site of the stadium, are both near mount Pagus on which are the ruins of the acropolis, chiefly of Byzantine work. A colossal theatre discovered 1852 near the old castle is in tolerable preservation. The church of S. Dimitri still shows the ancient usages of the apses veiled by curtains. The other churches and mosques are numerous but of no interest, except the Armenian cathedral, spacious and purer in style. Modern Smyrna suffered severely by a fire 28 July 1841. TOURNEFORT, *Voyage to the Levant*, 8vo., 1741, ii, 495, 506. DALLAWAY, *Constantinople*, 4to., 1797, 196, 288. FRANKLAND, *Travels to and from Constantinople*, 8vo., 1829, i, 240. MACFARLANE, *Constantinople*, 4to., 1829, i, 123. KEPPLE, *Balkan*, 8vo., 1831, ii, 302. ARUNDELL, *Asia Minor*, 8vo., 1834. PROKESCH, in *Wiener Jahrbücher der Literatur*, 1834, vol. 67. LABORDE, *En Orient*, fol., 1838. WALSH, *Scenery of the Seven Churches*, 4to., 1850. Twelve photographs by PULLAN and TROTMAN, 1876. ILLUSTRATED LONDON NEWS, 1845, vii, 83. 14. 28. 50.

In 1865 J. T. Wood was building an English protestant church of Gothic architecture at Boudjah, near Smyrna; BUILDING NEWS *Journal*, 1865, xii, 688; and given in No. 69 photograph, 1873-4. The railway to Aidin was opened 14 Nov. 1861. NYMPH is about thirteen miles distant; EPHEBUS.

SMYTH (HENRY), was 1502 (*temp.* Henry VII) clerk of the castle of Windsor; appointed 1509, 1 Henry VIII, clerk and overseer of the king's works in England, succeeding Thos. Hunt; and comptroller and clerk of the works in Windsor castle during pleasure with 6d. per day. From the numerous entries in the following records, he appears to have given the king's orders and received payment for the work done at various palaces, principally Windsor and Greenwich. NICOLAS, *Privy Purse Expenses of Queen Elizabeth of York*, 8vo., Lond., 1830, p. 31. TIGHE AND DAVIS, *Windsor*, 1858, i, 431. *Privy Purse Expenses of King Henry VII*, in Brit. Mus., Addit. MS. 7099, given in BENTLEY, *Excerpta Historica*, 4to., 1831. *The Rolls Calendar, temp.* Henry VIII, i-v, 1862-80 giving the King's Book of Payments, 1509-18; a duplicate copy in B. M., Addit. MS. 21,481; the Household Expenses of Henry VIII, being Addit. MS. 7100, in which Smyth was paid £10 in 1511 June 23 as his fee "in recompense for the king's stage at his coronation". In 1526 he was probably old or ill, as (iv, April 1526) "Thomas Warde, the king's harbinger had the reversion of the office of comptroller of the works in Windsor castle granted during pleasure to Smyth by patent of 13 April 15 Henry VII"; and in May 1528 (p. 1897), 20 Henry VIII, Smyth and T. Flower to be clerk in survivorship of the king's works in England with the usual fees,—vacated by Flower the survivor, 1 Oct., 24 Henry VIII; and 1529 (p. 2640) 13 Aug., 21 Henry VIII, Jacobina Smyth was pardoned as administratrix of Smyth, clerk or comptroller of the king's works *temp.* Henry VII, *alias* purveyor of materials for repairs at Calais, etc.

SMYTH (JOHN), about 1439-40, warden of masons at the building of Eton college for king Henry VI. The warrant 6 June for taking as many masons as were required is addressed to Robert Westerly master mason; while that of 13 July is addressed to John Smyth warden of masons and to Robert Wheteley warden of carpenters; BENTLEY, *Excerpta Historica*, 4to., 1831, p. 45-6. Also *Rot. Pat.* 26 Henry VI, p. 2, m. 35; in 1450.

SMYTHE (sir THOMAS), knight, secretary of state to king Edward VI and to queen Elizabeth, is said to have designed and built 1568-75, after his return from Italy, his own residence Hill hall, near Epping, Essex; but in his will, R. KIRBY is named as "chief architect". NEALE, *Seats*, 2nd Ser., 1824, i,

gives two plates which may show "the considerable alterations" of later date.

SMYTHSON (ROBERT), born about 1535, "gent. architect and surveyer unto the most worthy house of Wollaton, with diverse others of great account"—"ob. xv Oct. 1614, æt. 79," according to the epitaph in Wollaton church, Northamptonshire. Documents of 1578 still in existence, show that R. S., "freemason" at 1s. 4d. per day, was employed at Longleat (begun between 1549 and 1566), probably in the courtyard elevations and interior of the house—the three external façades being probably Italian work, for reasons assigned in BUILDER *Journal*, 1882, xlii, 570, giving a view; and referring to JACKSON, *History*, 8vo., 1868. Wollaton hall is usually said to have been designed by John of Padua or by John Thorpe, for sir Francis Willoughby. A plan of it is inscribed "Inchoate 1580-88" in Thorpe's book of drawings in sir John Soane's museum. Smythson has also been named as the "undertaker", and "overlooker"; but W. Warner, in BUILDING NEWS *Journal*, 1870, xviii, 383, states that "the original drawings are preserved and are signed by Smythson (*idem*, 1878, xxxv, 474, 501, 554, 635, 712). BRITTON, *Arch. Antiq.*, 4to., 1809, ii. NEALE, *Seats*, 4to., 1821, iv. It is built of Ancaster stone. For Elizabeth countess of Shrewsbury, he may have designed 1576-1607 and later Hardwick, Derbyshire, with a gallery 169 ft. 4 in. long, 22 ft. 2 in. wide, and 26 feet high; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1874, p. 196. 1. 3. 19.

SMYTHSON (HUNTINGDON), "architect, died Dec. 27, 1648" according to the epitaph in the chancel of Bolsover church, Derbyshire. To him is attributed 1604 the first portion of Welbeck abbey, Notts, for sir Charles Cavendish (died 1617); 1623 the riding house there for W. Cavendish, duke of Newcastle; and 1625 finished the stables, which are 130 ft. long, 40 ft. wide, for 40 stalls, now belonging to the duke of Portland (NEALE, *Seats*, 1821, iii). 1617 he took a plan of Nottingham castle (DEERING, *Hist. of Notts*, 4to., 1751, p. 189). When W. Cavendish, duke of Newcastle, proposed 1634 to add to and repair Bolsover castle, Derbyshire (begun 1607 by the countess of Shrewsbury and completed 1613 by sir Charles Cavendish), he is said to have sent Smythson to Italy to collect the best designs, and then to have built the noble apartment erected by the duke: it was unroofed 1740. This is also said to have been done by MARSH, who may have been the builder only. WALPOLE, *Anecdotes*, edit. 1862, i, 250. NOTES AND QUERIES *Journal*, 1856, 2nd Ser., i, 333, confusing the two Smythsons. 1. 19.

SMYTHSON (JOHN) is supposed to have designed 1674-9 Nottingham castle, for William Cavendish, duke of Newcastle, according to his will and the model; continued for his son Henry Feb. 1680 to April 1683, at a cost of £14,002 7s. 11d. DEERING, *History of Nottingham*, 4to., 1751, p. 189. It is also attributed to MARSH of Lincolnshire, perhaps the builder. He died 1678 (WALPOLE, *Anecdotes*, edit. by DALLAWAY, ii, 74). Many drawings by this family are stated to have been purchased by lord Byron (before 1762) from the descendants who lived at Bolsover.

SNACKET. A hasp or HAPSE, for a casement. 1. 4.

SNAIL CREEP. The common form of pointing granite or limestone uncoursed walls.

SNAILERY. "A snailery and a place for breeding tortices be made at Kensington for his majesty's service"; 11 May 1725. A long walk was formed and planted at Gayhurst by Kenelm Digby for breeding edible snails as an antidote for consumption.

SNAKE HEAD MOLDING; see SERPENT.

SNAKE STONE. A fine grit found at Water of Ayr, Ayrshire, used by marble polishers, and sold by most drysalers. The snake stone used by lithographers is a carbonate of lime, and found in Germany and India.

SNAKE WOOD, or Letter or Speckled wood; see BROSIMUM and PIRATINERA. HOLTZAPFFEL, *Woods*, 8vo., 1843, p. 106. 23. 71.

SNATCHING. The term for making laths break bond for

plastering: it gives a better hold to the joists and makes a firm ceiling; *BUILDER Journal*, 1871, xx, 152.

SNECK, and **SNEKK**. A latch, lock, or some rude fastening of a door. **THUMB LATCH**. *SIBBALD, Chronicle of Scottish Poetry*, Gloss, iv, 1802. The usual fastening to cottage doors, of an iron bar or tongue moving vertically in a loop inside the door; it falls into a notch inserted in the lintel and opens from without by pressing on a latch. *ARCHÆOLOGIA*, xvii, 158. **SNIB**.

SNECKED RUBBLE. Uncoursed rubble, in which the stones are used as they occur, the interstices between the larger stones being filled with smaller pieces. When this is done with great nicety, and so as to preserve perfectly the horizontal and vertical bond by the complete interlacing of the amorphous stones, the operation is termed *snecking*.

SNECK HARLED. A northern or Scotch term for **ROUGH CAST**.

SNEEZING BRICK. One of the names given to the burnt bricks which case the clamp before burning; *BRICK* (p. 140).

SNIB. A small piece of wood, by inserting which into the loop of the **SNECK**, it becomes fast and cannot be raised from the outside. Later, it has been applied to the bolt now often attached to door locks. *NOTES AND QUERIES Journal*, Dec. 18, 1869, p. 545.

SNIFE'S BILL PLANE. One having a sharp arris for getting out the quirk for a molding. **BEAD PLANE**. 1.

SNOW. Vapour frozen in separate crystals of ice, afterwards united together so as to reflect light to the eye in great abundance from all, producing a sensation of whiteness; the assemblages of crystals constituting snow. 20 in. of snow equal to one inch of thawed water; C. H. SMITH, in *BUILDER Journal*, 1869, xvii, 347. In Oct. 1867 the commissioners of sewers for the city of London advertised for suggestions, etc., for the removal and disposal of snow, after and during its fall. 157 replies were sent, and were arranged—1, snow to be melted by furnaces, boilers, or steam jets, etc.; 2, to be carted away to vacant spaces; 3, thrown into sewers; 4, dissolved by salt, or chemical agents; 5, heaped in ridges in centre or sides of roadway to melt gradually; 6, to be rolled by steam or horse rollers. Temporarily, they adopted 2, and obtained a wharf for carrying the snow away in barges. Burt, pavier, writes (Jan. 1886): "A fall of snow in the winter time should be anticipated, and proper arrangements made beforehand for removing it at once to the sides of the road by having snow ploughs (boards nailed together), or stiff rotary brushes or scrapers, available to do this by horse power, channels being afterwards cut through the collected snow for drainage purposes. Only in this way can the work be properly done." *The Removal of Snow*, in *BOULNOIS, Municipal and Sanitary Engineers' Handbook*, 8vo., 1885. Experiment by steam, after a heavy fall 2 Jan. 1867, *BUILDING News Journal*, 1869, xvi, 69. A method was tried (1886) by carting the snow to an open space and then pumping upon it by fire engines; the great heap was demolished in three or four hours, and appeared a success. 14.

SNOW BOARD. A grating to cover a flat or wide gutter, consisting of deal laths 3 in. by 1½ in., fixed half an inch apart on bearers about 4 in. deep shaped on the lower edge and spaced about 2 ft. 6 in. apart. The lengths will depend on the position and the convenience of handling when lifted for cleaning or painting. The snow would rest on this framework, and as it melts it drains through and flows away at once. These boards also protect the metal from the sun, and from traffic in repairs. All outlets from gutters should be covered with domical wire or other gratings to prevent the stoppage of the pipe from leaves, birds' nests, dirt, or paper. An inverted V trough has been suggested, but it would only be serviceable in narrow gutters.

SNUG. A projection in cast iron work to secure other pieces in position; as at each end of the columns at the Crystal palace, affording the means for rivetting, or securing by bolts, the column above and below to the three-feet connecting piece.

The projecting piece (one or more) cast on the ends of two girders to receive a collar and thereby hold the parts together; the collar is frequently shrunk on. A lug or holdfast, and **ANCHOR**, are for similar purposes in building. *BUILDING NEWS Journal*, 1858, iv, 502, col. a at bottom, and illustration.

SOAN (as in publication of 1778, and in royal academy catalogue of 1779); **SWAN**, in *SANDBY, Hist. of Royal Academy*, 8vo., 1862, i, 388; and **THORNE, Environs of London**, 1876, s. v. Ongar Hill; both probably from **BRAYLEY, Surrey**, 4to., 1841, ii, 231.

SOANE (sir JOHN), R.A.; F.R.S.; and F.S.A.; was born 10 Sept. 1753, at or near Reading, the son of a bricklayer; 1768 entered the office of G. Dance, and then of H. Holland until 1776; 1772 obtained silver medal at royal academy; 1776 the gold medal; and was introduced by sir W. Chambers to George III who nominated him travelling student for three years; 1777 March left for Italy; in the academy of fine arts at Florence is a drawing by him dated 1779, the only English one there in 1802-3; and 1780 returned to London; 1788 Oct. appointed (through lord Camelford) arch. and surv. to the bank of England (resigned 16 Oct. 1833); 1791 appointed clerk of the works to S. James's palace, the houses of parliament, and other public buildings in Westminster; resigned and succeeded 20 June 1794 by J. T. Groves; 1792 original member of the architects' club; 1795 appointed architect for new buildings and repairs in the royal parks, woods, and forests, under the crown; 1807 March appointed clerk of the works of the royal hospital at Chelsea, succeeding S. Wyatt; 1809 March 27 first lecture (appointed professor 1806) at R.A., fourth on 29 Jan. 1810; 1812 lectures resumed; 1813 elected grand superintendent of works to the united fraternity of Freemasons; 1815 appointed one of the three attached architects to the office of works under the crown; 1835 March presented with medals from the architects of England (**GOLDCUTT**). Among his pupils were J. H. Good; S. Burchell; D. Laing; John Sanders; R. D. Chantrell; A. P. Mee; G. Bailey; E. M. Foxhall; H. H. Seward; C. Malton; F. Edwards; J. Adams; G. Underwood; G. Basevi; J. Buxton; C. Tyrrell; H. Parke; D. Mocatta; G. Wightwick. J. Gandy and C. J. Richardson were with him for many years. His portrait was painted by sir Thomas Lawrence; a copy was presented to the Institute of British Architects; one in *FRASER'S MAGAZINE* about 1835. A bust by sir F. Chantrey in his museum. He died 20 January 1837, and was buried in his mausoleum in the cemetery of S. Giles' in the Fields, near old S. Pancras church.

He wrote *Designs in Architecture*, 38 pl., 4to., 1778; 1797, and said to have been bought up by him. *Sketches in Architecture*, 1783, 1793; 1798. *Plans, etc., of Buildings executed in several Counties*, 47 pl., fol., 1788. The large timber bridge over the river Limmath is given from a drawing by him, in *EBEL, Schilderung*, 8vo., Leip., 1798. *Letter to the Earl of Spencer*, 8vo., 1799 (H. HOLLAND). *On the Causes of the present Inferior State of Architecture in England*, in *HOARE, The Artist*, 4to., 13 June 1807. *Designs for Public Improvements*, only 25 copies printed, 54 plates, fol., 1827; and with additions as *Designs for Public and Private Buildings*, fol., 1828. *Proceedings respecting the New Law Courts at Westminster*, 25 pl., fol., 1828: and the following pamphlets:—*Statement of Facts—New House of Lords*, 8vo., 1799; *Pitzhanger Manor House, Plans, etc.*, 4to., 1802; *Observations on the Rebuilding of the H. of Parl.*, fol., 1835; and *Description of three Designs for the two Houses*, 4to. (1836). Illustrations of many of his works and designs are given in the above publications.

In 1833 Soane obtained an act of Parliament settling his museum, etc., supposed to have cost £60,000, given in his *Description of the House and Museum, etc.*, 150 copies printed for private distribution, 4to., 1832 and 1835. *BRITTON, Union of Arch., Sculpture, and Painting, etc.*, 4to., 1827. *PENNY MAGAZINE*, No. 363, for Oct. 31, 1837. *CIVIL ENGINEER, ETC., Journal*, 1840, iii, 155. *HAYDON, Life*, 1876, ii, 93. *KNIGHT*, in his *QUARTERLY MAGAZINE*, 1824, wrote *Ode to Dulwich College*,

on hints by S. Whitwell, suggesting a new order of architecture, "the Boeotian order", which caused the action of *Sonne v. Knight*, 12 June 1827; *Moody and Malkin*, Nisi Prius, No. 74; *KNIGHT, Passages, etc.*, 8vo., 1873, i, 322; *BUILDER Journal*, 1858, xvi, 542; 1864, xxii, 238. The Satire "The Modern Goth", on his peculiar style is given in *NOTES AND QUERIES Journal*, 2nd Ser., xi, 289, 436.

DONALDSON, *Memoir*, with List of buildings drawn up by G. Bailey, 8vo., Feb. 1837; printed in *FREEMASONS' QUARTERLY REVIEW*, iv, 91. BRITTON, *Brief Memoir*, 4to., 1834. *MORNING HERALD Newspaper*, 24 Jan. 1837; reprinted in *LOUDON, Architectural Magazine*, iv, 157-8, with additions. *Remarks and List of Bailey's reprinted in BUILDER Journal*, 1846, iv, 577, 590. *Lectures*, by S. SMIRKE, *idem*, 1862, xx, 110, 129. Later matter by P. CUNNINGHAM, *idem*, xx, 743. Criticism, *CIVIL ENGINEER, etc.*, *Journal*, 1847, x, 382. TITE, *Recollections of a Course of Lectures*, 1817, read at Roy. Inst. of Brit. Archts., Nov. 1847 and April 1848. 1. 14.

1784 alt. and add. to Mulgrave hall, Whitby, Yorkshire, for the earl of Mulgrave, and to Ryston hall.

... designed a house for rev. G. Gooch, Norfolk.

... Tendring hall, Suffolk, for adm. sir J. Rowley.

1785-8 ... a house at Shottisham, Norfolk, for R. Fellowes, esq.

... Letton hall, for B. G. Dillingham, esq.

1788-94 alt. and add. to Norwich castle.

1789-90 designed Blackfriars bridge, at Norwich; joints lended to prevent friction or slipping.

... alt. and add. to Chillington, for Mr. Gifford.

... designed a house at Gunthorpe, for rev. C. Collyer.

... alt. and add. to Bentley priory, near Staunmore, for marquess of Abercorn.

1791 ... to Skelton castle, for J. Wharton, esq.

1790-9 ... to Moggerhanger house, Beds., for G. Thornton, esq.

1790-4 designed Buckingham house, 92 (?), Pall Mall, for marq. of Buckingham. (R. F. BRETtingham.)

... mansion in S. James's sq., for duke of Leeds.

1791-2 alt. and add. to Barons court, Ireland, for marq. of Abercorn.

... to Wimpole, for earl of Hardwicke.

1792 designed his own house, No. 12, Lincoln's Inn Fields (see 1812).

... alt. and add. to Sulby lodge, Northamptonshire, for Rene Payne, esq. (NEALE, *Seats*, iii).

1793-6 designed Tyringham hall, near Newportpagnel, for Wm. Praed, esq. (NEALE, *Seats*, i).

1794-1802 designed a house at Reading for W. B. Simmonds, esq.

1794 designed Entrance gates and lodge, Hyde park, opposite Gt. Cumberland street (taken down).

... a house (near Southampton) for Hon. Mrs. Yorke.

1795 alt. and add. at Bagden house, for earl of Ailesbury.

1796 ... to Hinton S. George, for earl Paulett.

... designed house at Reading, for L. Austwick, esq.

1797-9 alt. and add. to Holwood house, for Rt. Hon. Wm. Pitt.

1797-8 designed house in Stratton st., Piccadilly, for col. Graham.

... alt. and add. to house in Grosvenor square, for countess of Pembroke.

1799-1808 alt. and add. to No. 19, S. James's square, for S. Thornton, esq.

1800-1 alt. and add. to Aynho, Bucks, for W. R. Cartwright, esq. (NEALE, *Seats*, i).

1801 designed the banking house in Fleet st., for Messrs. Praeds and Co.

1802 alt. and add. at Albury park, for S. Thornton, esq.

... at Cricket lodge, near Chard, for vis. Bridport.

1804 designed Obelisk in the Market-place at Reading, for E. Simeon, esq.

... a house, warehouses, etc., in Fountain court, Aldermanbury, for W. A. Jackson, esq.

... villa for himself at Pitsinger, near Ealing, Middlesex (old part by G. Dance, jun., 1768: *RICHARDSON, New Vit. Brit.*, fol., 1808, pl. 57-9).

... alt. and add. to Port Eliot, S. Germans, Cornwall, for lord Eliot.

1804-7 ... at Ramsey abbey, Hunts, for W. H. Fellowes, esq.

1804-6 ... to house at Rochampton, for J. Thomson, esq.

1805-19 ... to No. 23, S. James's sq., for lord Eliot and the earl of S. Germans.

1805-6 designed the Gothic MS. library at Stowe house, Bucks.

1806-7 alt. and add. to Macartney house, Blackheath, for Hon. G. F. Lytton.

1806-11 designed mansion at Moggerhanger, Beds., for S. Thornton, esq.

1807 ... tomb in the churchyard, Leytonstone, Essex, for Sam. Bosanquet, esq.

1808 made designs for the completion of Teymouth castle, for earl of Breckinbale.

1808 made designs for the Royal Acad-mical Institute, Belfast.

... designed a Mausoleum, adjoining the house of Mr. Desenfans, in Charlotte street, corner of Portland road.

1808-10 ... the five houses in Princes street, forming "New Bank buildings".

1809 ... Infirmary at Chelsea hospital.

1810 alt. and add. to Whitley abbey, near Coventry, the seat of the Right Hon. lord Hood.

... designed Entrance to the London dock company house.

1811 ... counting house of Messrs. Thellusson and Co., Meeting-house court, Old Jewry.

1812 ... house No. 18, Park lane, for Mr. Robins.

... alt. and add. to Everton house, Beds., the seat of W. Astell, esq.

... designed his own house and museum, No. 13, Lincoln's Inn Fields.

... the gallery at Dulwich college, for pictures bequeathed by sir F. Bourgeois, 144 ft. by 20 ft. by 20 ft.; with a Mausoleum.

1813-15 designed a house at Ringwould, near Deal, for rev. G. Monius.

1815 alt. and add. to earl of Hardwicke's house in S. James's square.

1816-17 designed farmhouse at Butterton, Staffordshire, for T. Swinerton, esq.

1818 alt. and add. to the banking house of Messrs. Grote, Prescott, and Co., in Threadneedle street.

1818-9 designed the National Debt Redemption and Life Annuities office, Old Jewry.

1818 alt. and add. to Marden hall, near Hertford, for G. Thoruton, esq.

1820-1 designed houses in Regent street for Mr. Robins and others, Nos. 156-172; and 135-167 or 169-201 on opposite side.

1820-7 ... the law courts at Westminster (pulled down 1884).

1820-2 ... Wotton house, Bucks, for marq. of Chandos.

1821 ... Pelwall house, near Market Drayton, for Furney Sillitoe, esq.

1822-4 ... the Scala regia, royal library, in the house of lords.

1823-5 ... S. Peter's church, Walworth, over £19,000 for 2,000 seats.

1824 ... Insolvent Debtors' Court, Portugal street.

1824-8 ... Trinity church, Marylebone ("Troubles", in SMITH, *Mary-church*, p. 119).

... S. John's church, Bethnal green; cost over £17,000 for 2,000 seats.

1824-7 ... the board of trade and the privy council offices, Whitehall (elevation in *CIVIL ENGINEER, etc.*, 1846, ix, 298; new elevation, 261).

1825 ... additional committee rooms, house of lords.

1826 ... additional committee rooms and library, house of commons.

... the masonic hall, Great Queen street (burnt 1884).

1829-30 refaced the banqueting house, Whitehall, with stone.

1829-33 designed State-paper office, Duke st., Westminster (pulled down 1862 Foreign office by sir G. G. Scott).

1831 ... the ante-room to the sculpture gallery of sir F. Chantrey, R.A., Bolgrave road, Pinlicko.

SOAPSTONE. A variety of magnesite, lime, and alumina. JADE. ALL THE YEAR ROUND *Journal*, viii, 1863, p. 63. The so-called soapstone of Somontin is a volcanic earth from Santorin. The name of soapstone has also been given to the STÉATITE of the United States. BOSTON.

SOAVE (FELICE), of Lugano, was elected 10 Sept. 1795 to continue the works at Milan cathedral. He was succeeded July 1802 by G. Antolini, and died April 1803. 68.

SOBRE (JEAN), of Paris, born about 1760; with Happe designed 1791-2 maison et cour Batave, rue S. Denis; and 1796 decorations du salon de madame H., rue Vivienne, both given in KRAFFT ET RANSONNETTE, *Maisons et des Hôtels à Paris*, fol. (1802), pl. 115-8, and 87-8; the former also in LEGRAND ET LANDON, *Descr. de Paris*, 8vo., 1809, iv, 27. The *Projets d'Architecture; Grands Prix*, gives 1795, pl. 30, his Obelisk for the place des Victoires; 1794, pl. 41, his Arc de triomphe; and 1800, pl. 83, the Colonne for the place Vendôme. DETOURNELLE, *Architecture Nouvelle*, 4to., Paris, an. xiii (1805), gives pl. 13, an Arc de triomphe; and pl. 95-6, the Temple à l'Immortalité. KRAFFT, *Arch. Civile*, fol., Paris, 1812, pl. 67-8, gives his Château de S. Assise on the river Seine, between Corbeille and Medun. KRAFFT, *Maisons, etc.*, fol. (1802), gives pl. 5-6, the hôtel de S. Foy or S. Foix, rue Basse du Rempart, Chaussée d'Antin, 1775 by A. T. Brongniart, and divided 1798 by Sobre, the court and staircase being by Happe; LEGRAND, *etc.*, iv, 21, gives an elevation. Its porte-cochère is given in KRAFFT, *Portes-cochères*, fol., 1810; which work, pl. 12, also gives the entrance 1796 to the théâtre de la rue des Victoires. About 1805 he designed the théâtre de la Jeunes Artistes (destroyed), rue de Bondy, given in

LEGRAND, iii, 97. Sobre died 1815 "young but distinguished".
LONDON, *Annales*, xi, 85; v, 104; ix, 23; iii, 95. 68.

SOCCHI (BONIFAZIO), pupil 1592 of F. Ambrosini, designed at Bologna, 1615 the church of S. Antonio abate in S. Mamolo; and the church of Gesù e Maria, in the strada di Galleria; where also are attributed to him, 1615 the church of Madonna della Grazie (commonly di Porta), but it is by A. Laghi, 1726; and 1641 that of SS. Filippo e Giacomo, which is by F. Martini. At Parma some works are attributed to him. He died 1650 aged 84. 68. 94. 105.

SOCKET. At one end of a stoneware or iron pipe, a collar is made within which is a sinking to receive the end (or faucet) of the next length of pipe. This sinking is carefully filled in with melted lead, cement, or other material to prevent the leakage of gas, water, drainage, etc. See HEAT, *Detached Essay*, p. 13. Stanford's patent joint for glazed stoneware pipes, being absolutely water-tight, as advertised April 1877, is made by Doulton and Co. Wall's "patent water-tight compound joint" is one of the latest inventions. *First Maker of Earthenware Sewer and Drain Pipes*, *BUILDER Journal*, 1860, xviii, 428, 470, 534. *Sockets for Water Mains*, *BUILDING NEWS Journal*, 1871, xx, 185-6. BALL AND SOCKET JOINT.

SOCKET. The Romans did not hang the doors from the jambs, but by pivots attached to the hanging stiles at top and bottom, working in sockets let into the lintel and sill. If the door was a bivalve, one valve of which folded back upon the other, the hinges which connected the two leaves were strap hinges; DONALDSON, *Ancient Doorways*, 4to, London, 1833, p. 9. LAYARD, *Discoveries in Nineveh and Babylon*, 8vo. (1853), p. 163, gives a cut of two massive bronze sockets, 5 in. diameter, in which turned the hinges of a gate of the palace at Nimroud; they are now in the British museum. 1. 78.

SOCKET CHISEL. A strong sort of chisel used by carpenters, of various sizes distinguished by the breadth of the blade; CHISEL.

SOOLE, or ZOOLE. The Italian term used by English writers of the seventeenth century for a plinth, having neither base nor cornice. ZOCCOLO. QUADRA is used by VITRUVIUS.

SOCOLOV, or Sokolov, or Socloff; 1795 designed the imperial library at S. Petersburg, completed 1800 by L. Rusca.

SOZAS or rather Sozzo; see ALBINA (G.), of Palermo.

SODA. The common oxide of sodium; and the hydrated oxide or caustic soda. The normal carbonate was formerly prepared artificially from the seaside plant called Salsola, known when burnt as "sweet barilla"; also from kelp. Caustic soda is kelp or barilla made from sea wrack; ALL THE YEAR ROUND *Journal*, 1862, vii, 562. It is now chiefly manufactured by the process of Leblanc, in first converting chloride of sodium or common salt into sulphate of sodium or Glauber's salt, and then converting the sulphate into carbonate by heating it with carbonate of lime and coal. Soda is used for domestic and cleansing purposes generally. Soda in glass causes it to undergo considerable change after a lengthy exposure to the air. If it have originally a greenish tinge it becomes brown after a time; and if very white it deteriorates rapidly, showing first a yellow, then a brown, and finally a violet film. "Silicate of soda", in the form of a thick syrup and diluted with water, applied as a paint to woodwork, is a preservative from fire for 1½ hour only; *BUILDER Journal*, 1859, xvii, 477. "Tungstate of soda" was applied 1863 to saturate fabrics to prevent their taking fire; it does not impair their appearance or colour. 14.

SODER, properly SOLDER.

SOEST. A town of Westphalia, situated on the river Soesterbach. It has still lofty walls with towers and five gates; the osthoven-thor 1535 is a fine example. There are ten or twelve interesting churches. The cathedral dedicated to S. Patroclus, is an unaltered Romanesque building with an inside narthex end of XII cent., with paintings of same date; the tower, 1200, is 244 ft. high; GRUEBER, *Sammlungen für Christ. Mittel. Baukunst*, fol., Augs., 1839-41, pt. vi, pl. 30, gives a plan. The

ARCH. PUB. SOC.

Wiesenkirche, 1314 or 1330-43 or commenced 1340 by meister Johannes Schendeler, is pure Gothic, 100 ft. by 76 ft., choir 76 ft. high; west towers 1429, having open-work spires and three rich portals (restored 1850); nave later; good glass in choir and nave; good xv cent. sakramentshaus; the altar is given in STATZ, pl. 129. S. Peterkirche, Romanesque nave end of XIII cent., narthex inside 46 ft. long; choir pointed; nave about 92 ft. The Thomaskirche, apse XIII cent.; S. Maria zur Hohe, late transition; and S. Paulskirche and Grauekloster are XIV cent. The Nicolai chapel near the cathedral has its walls covered with XII cent. paintings. An anbury (*wards clerk*) from a church, in STATZ and UNGEWITTER, *Gothic Model Book*, fol. (1860?), pl. 103. STREET, *Tour*, in *ECCLESIOLOGIST Journal*, 1855, xiii, 370-2. 28. 50. 92. 96.

SOFA, formerly Sophy. "Sophia ou Canapé" in *ENCYCLOPÉDIE DES ARTS ET METIERS, Architecture*, i, pl. 36. "An apartment of state much used in the Eastern countries for the entertainment of considerable guests", 1736. BLONDEL, *Cours d'Arch.*, 8vo., Paris 1773, iv, 282. 4.

SOFFIT; also soffite, schofeet, sapheta, soffita, saffita, sophitte, soufett, sopheat, as used by various old writers (It. *soffita*; Fr. *douelle*, *plafond*, *soffite*). Derived from the Italian (TRABEATION) for a sort of ceiling, as to the heads of window openings; the underside of a flight of stairs; also to the ceiling of an apartment formed by cross-beams or flying cornices with square panels in it (SERLIO, *Architettura*, fol., 1663, p. 355). Also the underside of the DRIP or CYMATIUM in a cornice. LACUNAR or laquear. PLAFOND or plafond.

A "panelled soffit" of an arch appears to be peculiar to Widscombe church, Bath; Swanswick church; and at Englishcombe, as stated in *ECCLESIOLOGIST Journal*, 1846, v, 78.

SOFFIT CUSP. PALEY, *Gothic Architecture*, p. 161, describes it thus: "The earliest cusps spring directly from the soffit, nearly on a plane with the glass—thus they appear to the eye rather as extraneous additions to, than (as later) as integral parts of the monials"; FREEMAN, *Window Tracery*, 8vo., 1851, p. 13-4.

SOGD and SOGDIANA. This ancient locality lay between the rivers Oxus and Jaxartes, comprising the greater part of the present Turkestan with the kingdom of Bokhara, which is still called Sogd. The ancient so-called towns were probably only large forts along the rivers, and were well defended against Alexander. Khojend; Nautaca near Karshi or Naksheb; and Marghinan, may represent some of them. The Sogd of Samarcand comprises the plains and villages round about that city.

SOHIER (HECTOR), born at Caen in xv cent., commenced 1521 in the style of la renaissance, the chevet and the vaulting of the choir and aisles, of the church of S. Pierre, at Caen. FRÈRE, *Bibliog. Norm.*; HUET, *Orig. de Caen*, p. 193.

SOIGNIES QUARRY, with that of Ecaussinnes in Belgium, supply a good limestone which is sawn into slabs and finely polished, and exported to Holland and France under the general term of "granit de Flandre". BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 22. FELNÉL.

SOIL and sell. An old way of writing sill, now CILL.

SOIL; see CLAY; MARL; FOUNDATION. NIGHT SOIL.

SOIL. A provincial term for the PRINCIPAL RAFTER of a roof. 2.

SOIL-PIPE (Fr. *chause d'aisance*). The name of the tube for carrying the soil or refuse of a water-closet into the drain. It is generally vertical, since the introduction of the water-closet in the ground and upper stories of a house. A ventilating cowl is now usually fixed at the top of it, and carried above the roof, with a proper inlet for fresh air at the bottom where possible. If a pipe be fixed inside, and kept warm by the heat of the house, a permanent ventilation upwards is much more probable than if its external surface be chilled by the outer air. On this account also a stoneware pipe is better than metal, especially iron; and it is less liable to get frozen. But it may be protected, if external, by a casing of brickwork. Or, a

soil-pipe not merely internal but isolated within a larger and ventilated pipe, through which also an upward draught is equally to be obtained. STENCH TRAP. Discussion on "inside v. outside", *Builder Journal*, 1881, xl, 24; 141. 1879, p. 239. *Action of House Sewage on Lead Pipes*, *Building News Journal*, 1869, xvii, 496. PLUMBER.

SOISSONS (anc. Noviodunum; the capital of the Suessones; later Augusta). A town in the department Aisne, in France, situated on the river Aisne, over which is a good stone bridge of XIII cent.; great arch 1814 (DALY, *Revue Gén.*, 4to, 1847, vii, 317). After 486 it became the capital of the Franks until the seat of government was removed to Paris. It is walled and strongly fortified, and the numerous sieges have caused the town to be greatly modernised. It is the see of a bishop united with Laon. The cathedral dedicated to the assumption of the Virgin, S. Gervase and S. Protasio, was completed 1212; the fine south transept and its *salle capitulaire* date 1168-75; it was restored 1883. This edifice is highly praised for its proportions by FERGUSSON, *History*, etc. INKERSLEY, *Inquiry*, etc., 8vo., 1850, p. 259-62. KING, *Study Book, Mediæval Art*, fol., 1858-68, ii, 6 plates. VIOLLET-LE-DUC, *Dict. Rais.*, s. v. Cathédrales, p. 310. DE CAUMONT, *Bull. Mont.*, 8vo., Caen, 1868, 4th Ser., iv, 439. GERMAIN, *Hist. de l'Abbaye de N. D.*, 4to, Paris, 1675. B. DE LA BORDE, *Voy. Pitt. en France*. DALY, *Revue*, ix, 372. The gable of the north transept is given s. v. in *Illustrations*, 1859, pt. 1.

Of the former grand royal abbey of S. Jean des Vignes, there is only the west end of the church with its two towers, XIII cent.; the spires much later; damaged 1870; a fragment of a cloister 1230-40. MONASTICUM GALLICANUM, fol. (DALY, ii, 274; ix, 377). DU SOMMERARD, *Album des Arts*, etc., 8th Ser., pl. 1, and 2. Church of S. Waast (in a suburb), by Boeswilwald. DALY, *Revue Générale*, 1856, xiv, 67; pl. 10. Church of St. Léger, early XIII cent.; but nave and west bays of late work; has a crypt with paintings. S. Pierre is a desecrated church. NODIER ET TAYLOR, *Voyages Pitt.* (Picardie), fol., 1835-48, ii, gives a plan of the cathedral, several plates of the abbey; an old church; churches of S. Léger, and of S. Pierre au Parvis; with a timber house in rue S. Christophe. Also the prison 8 ft. by 3 ft. of Louis le débonnaire (discovered *cir.* 1816); and the sepulchral chamber of the kings of Soissons, in the crypt (all that remains) of S. Médard, near the city (DALY, ix, 373; 376). Fragments of white marble of a tomb to the Roman Syagrius, son of Gillon, end of v cent., formerly at S. Médard, are given in La Borde, *Mons. de la France*, fol., Paris, 1816, i, pl. 101. PREMONSTRATENSIAN or white monks.

The hôtel de ville, XVIII cent. contains the museum in which are many statues removed from S. Yved de Braine; the theatre, *cir.* 1820 by A. M. Peyre. The pavillon des arquebusiers, 1623, is given in ROUYER ET DARCEL, *L'Art Architectural*, 4to., Paris, 1863-6, ii, 21, pl. 19-20. MARTIN AND JACOB, *Hist. de S.*, 8vo., Sois., 1837. 14. 28. 50. 96.

SOISSONS (JEAN DE), also DE DAMAS, mason, July 1509 visited, with Jean Bailly, his nephew, and others, the church of S. Jean at Troyes. In 1509 he went to Troyes with Martin Chambiges his father-in-law, then architect-in-chief of the works at the cathedral; 1512 Jean was directing the works at Troyes, and had laid the foundations of the two towers. He was sent to Beauvais by the chapter to fetch M. Chambiges who surveyed the work; and in 1519 Jean succeeded him, and died 21 Dec. 1531 at Troyes; he was succeeded by J. Bailly. LANCE, *Dict. Biog.* ARNAUD, *Voy. Archéol. dans l'Aube*, 4to., Troyes, 1837. BERTY, *Les Grands Architectes*, 8vo., Paris, 1860.

SOISSONS (WILLIAM DE); same as SENS (W. of). 68.

SOL; TEMPLE TO; see SUN.

SOLANDA, sullung, or solin. A double hide of land, or about 240 acres. HIDE.

SOLAI, SOLER, SOLLAR; also solere, solyer, soller, solary. SOLARIUM. The private and upper chamber of a house of the XII-XIV centuries. The parlour or withdrawing room in a large house. A light upper room, loft, or garret. LOFT.

The "Soler above in the end of the hall — one chist stond-yng at my bed's head vpon the sollar"; PROMPT PAR., 192; *ARCHÆOLOGICAL Journal*, i, 218; 370; *Iceland Way*, by TAYLOR, *Trans. Arch. Inst. Norwich*; FOSBROKE, *Ency. Antig.*, 124; all given in CAMDEN SOCIETY, *Bury Wills*, 1851, p. 245. 1380 "a shop with solars built thereon"; deed in Guildhall museum, 1881. In the vaulting of the capella degli Spagnuoli, in the church of Santa Maria Novella, at Florence, is a painting of the descent of the Holy Ghost, the apostles being represented in an upper room, or sollar, such as is still seen in many of the old houses of the city. 28.

The rood-loft was called "solarium" and "solarium sanctæ crucis", hence ROOD SOLAR. In Norfolk, the ringers' loft or belfry is called the sollar, or bell sollar; FORBY. TYMMS, *East Anglian*, iii, 159. TURNER, *Dom. Arch.*, 8vo., 1851, i, 14, 155; ii, 86-8. 2. 17. 19.

SOLAR (JUAN DE); see SOLER (J. DE).

SOLARI (CRISTOFANO, and Cristoforo), called il Gobbo, C. Lombardo, il Lombardino, Tofano, and Solari Milanese, by various writers, was also a good sculptor; his brother Andrea (del Gobbo) Solari was a well-known painter of Milan. In 1503 Cristofano was consulted on the works at the cathedral at Milan; was elected architect 2 March 1506 and worked there up to 7 Nov. 1519. Before 1520 he completed the façade, *i.e.*, portico or vestibule to the church (begun 1491 by LAZZARI, p. 43) of Sta. Maria di S. Celso, after the death (date unknown) of its designer, Angelo de Manius or Maniis, and destroyed when the church was reduced to a simple oratory: he restored and enlarged the church of S. Eustorgio; designed the nunnery, façade, and church of Sta. Caterina, near the porta Ticinese (VASARI, iv, 528), also attributed by PAGAVE to A. Alessi; about 1530 the cupola and façade of Sta. Maria della Passione (carried out after his death); and several other religious and civil buildings in that city. At Warsaw, he designed the theatre. At Bologna, in the archives of the church of S. Petronio is a design by him, *cir.* 1580 made in conjunction with Giulio Pippi (Romano) in competition for the façade of that church. At Como cathedral, the designs of T. Rodario were commented upon by Solari, who after the death 1526 of Rodario altered them for execution. He executed numerous works to the façade of the Certosa near Pavia, and also in the church, including the fine statues to the tombs designed by G. J. della Porta, to Beatrice d'Este (died 2 Jan. 1497), and to Ludovico Sforza il Moro, her husband; said to have been removed 1564 to the church delle Grazie at Milan. G. G. Porta or Giacomo della Porta was a disciple and Giacomo della Porta worked under him. The dates of his birth and death appear to be unknown. VASARI, *Lives*, edit. 1851, iv, 543-4; v, 434; and edit. Florence, xi, 273. 27. 28. 30. 68. 94. 105. 112.

SOLARI (GIOVANNI), was from 24 January 1451 engaged on the cathedral at Milan. His son BONIFORTE succeeded 22 March 1459; and his son PIER ANTONIO assisted his father from 26 Oct. 1476 to 11 Feb. 1491. 27.

SOLARI (GUNIFORTE). The *certosa* at Pavia was commenced, 8 Sept. 1396 by Marco di Campione ("the church 1378-1402 by him with N. da Selli"), or by Bernardo da Venezia, who appears to have been succeeded by Solari as chief architect, who designed a façade never executed; he was followed by the brothers Mantegazza, sculptors. On the death 1490 of Solari, G. A. Omodeo was appointed *capo maestro* of the works and designed the façade; Cassell's *Magazine of Art*, 4to., 1883, p. 442-3.

SOLARI (SANTINO), of Como, also a sculptor, carried out 1614-68 the cathedral of SALZBURG from the model and complete set of drawings prepared by V. Scamozzi at Venice. The dome was burnt 1859. He was employed on the fortifications of the city; and on the Kaspis churchyard. He died 1646 in his 70th year. His younger brother GIOVANNI worked at Salzburg. 26. 68.

SOLARIO (PIETRO), of Milan, about 1491, for the grand

duke Ivan Vassilievitch, designed and built the Kremlin gate at Moscow, whereon is said to be an inscription with his name. FERGUSON, *History*, fig. 917. The tower to it was by C. Gal-
loway, 1626. 68.

SOLARIUM. A flat roof or terrace exposed to the sun, as usual at the tops of the Roman houses. An upper room. At Herculanum, an upper floor has only been found in one house; it consisted of a number of small chambers, of which six opened upon a terrace paved with mosaic, and looking eastward. POMPEII, by Soc. for Diff. of Useful Knowledge, 1832, ii, 17, 39. PLINY and VITRUVIUS describe how such terraces were formed. "The octagon tower of Stanwick church, Yorkshire, is open on all sides and well finished; it was probably the *solarium* which R. de Lyndesey, abbot of Peterborough (1214-22), is recorded to have built in that parish"; GUNTON, *Peterborough*. POOLE, *History of Eccl. Arch.*, 8vo., 1848, p. 358. **SOLAR.** **SOLIUM.** **SUMMER HOUSE.** **MAENIANUM.**

SOLERET, from *Solerettum*, the diminutive of *solarium*, is used for a room over a gateway, in *Liberate Roll*, 33 Henry III, as given in TURNER AND PARKER, *Dom. Arch.*, i, 217. 19. 78.

SOLDATI (GIACOMO), of Milan, was engaged *cir.* 1560 upon the works at the cathedral in the city. 10. 27.

SOLDER. Soudre in 1400; Sowdour, Souder in 1531, when it was sold at 3d. per lb.; and 1691 it was sold sealed by the plumbers' company of London; HALES, *Milled Lead*, 8vo., 1691, p. 103. An alloy of copper and zinc; copper, lead, and tin; lead and tin; bismuth, lead, and tin; and zinc and copper; of varying proportions as necessary for joining metals together by fusion. The plumbers' "fine solder" is used for lead lights, and may be coloured for brass work. "Soft solder" is made of copper, lead, and tin. **SOLDERING.** 1. 4. 14.

SOLDERADE; see MINHART, 1398.

SOLDERING of gold, silver, brass, lead, tin, and soft metals. (1400, Soundyng) Wood is glued together. Iron is welded. The process of uniting the edges or surfaces of similar or dissimilar metals and alloys by partial fusion. In general, alloys or solders of various and greater degrees of fusibility than the metals to be joined, are placed between them, and the solder when fused unites the three into a solid mass. Sometimes the edges of the metals are simply melted together with an added portion of the same metal. ELSNER, *On Galvanic Soldering*, in *TECHNOLOGIST*; in *ARCHITECT Journal*, 1850, ii, 497; and *CIVIL ENGINEER*, etc., *Journal*, xiii, 334. A quick method of soldering a long straight seam is described in *BUILDER Journal*, 1855, xiii, 168. **SOLDER.**

Messrs. Whitehouse and Laws have invented tools for soldering metals, whereby they are kept constantly heated. The "bitt" or soldering end of the tool is heated by a jet of gas supplied by a flexible tube. One mode of effecting this object is by conveying the gas through a tube in the handle of the tool; *BUILDER Journal*, 1857, xv, 343. A "lead burning machine" for joining edges by gas produced from sulphuric acid and zinc, is described in *BUILDER Journal*, 1873, xxxi, 852. **PLUMBERS' tools and firepot.** **LEAD WORK.** **BORAX.** **GREENING.** **FUSIBILITY.**

SOLDIERS' QUARTERS; see **BARRACKS**. A building so called at Pompeii on the south side of the city; one angle was 1766 restored at the time of discovery; it has since been called the forum Nundinarium; and later is considered to have been intended for the gladiators, whose arms were found; DYER, *Pompeii*, 8vo., 1868, p. 145-6. WOODS, *Letters*, 1828, ii, 359.

SOLE. The term for the underside of a plane as used in carpentry and joinery. A sill, base plate, or footing, whether of metal, stone, or wood, supporting a stanchion, column, or strut, or raking shore. The part of anything that touches the ground to sustain a weight. The bottom flange of an iron girder is called a **SOLE PLATE**.

SOLE; also soil, soyle, sowl, scill, and sill. A threshold. An old term for the CILL of a door or window. **SLEEPER.** 16. 17. 19.

SOLEA, **SOLEAS**, and **SOLEION**. The step, about 2 to 3 ft.

wide, on which stood the balustrade separating the choir from the sanctuary, in a **BASILICA** (p. 37, letter o on plan). *Annales de Phil. Chrétienne*, xix, 432. FASO DI SERRADIFALCO, *Monreale*, fol., pl. 2. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 17-8. 96.

SOLENHOFEN QUARRIES; see PAPPENHEIM.

SOLENTÉ (.....), designed 1812-32 the maison centrale de détention pour hommes at Melun, in France (Seine et Marne), to which département he was architect; it was continued to 1836 by Dupont, his successor. GOURLIER and others, *Choix d'Edifices*, fol., Paris, 1825-50, i, 163-4.

SOLER; see **SOLAR**.

SOLER Y FRANCA (don JUAN), born 11 March 1731 at Barcelona, studied under the engineer J. de Escofet. He was for thirty years the *maestro mayor* to the city of Barcelona, where 1770-2 he almost rebuilt the exchange (dating from 1383). He died 28 January 1794. 66.

SOLETREE. A term used with "owtshotsparres, sarkyn-boordes et geists ac soletrees pro thakking"; *Howden Roll*, *cir.* 1530. Also 1527-8 "in evis bordes, severns, et j soletre"; **SURTEES SOCIETY**, *Fabric Rolls*, *York Minster*, 8vo., Durh., 1859, p. 100; 354.

SOLEURE (anc. Salodorum, Salodurum, and Solodurum; It. *Solura*; Ger. *Solothurn*). A town in the canton of the same name in Switzerland, situated on both sides of the river Aar, crossed by two timber bridges. A gateway is given *s. v.* in the *Illustrations*, 1859, pt. 1 (or pl. 154). It is the see of a bishop, and the residence of the bishop of Berne. The munster, dedicated to S. Ours (S. Urs), considered the finest church in Switzerland, was rebuilt 1762-72 by Pisoni de Locarno, with interior decorations by Dom. Corvi; the tower is 190 ft. high. The former church of the Jesuits, now the gymnase, *temp.* Louis XIV; that of S. Etienne, in which Henri son of Conrad II was crowned 1038; the old town-house having several towers, and a stone staircase a "marvel of art"; a museum of Roman antiquities; the arsenal with an extensive collection of ancient armour; the convent of cordeliers, later the hôtel of the French ambassador; the prison designed by cons. Suri, considered a model; and the clock tower in the middle of the town, formerly considered to be a Roman work but now of Burgundian origin, a square of masonry rising 80 ft. without an opening, are buildings deserving notice. LA BORDE, *Voyage Pitt.*, 3 vols., fol., Paris, 1780-6, ii, 363-4; pl. 25. EBEL, *Manuel du Voy. en Suisse*, new edit. by RICHARD, 12mo., 1834. MARTIN, *La Suisse Pitt.*, etc., fol., Paris, 1835. 14. 28. 50.

SOLGER (BERNHARD), studied 1830 under Gaertner of Munich, travelled, settled at Nuremberg, where he was appointed *technischer baurath*, and designed the magnificent infirmary in that city, as well as numerous edifices. 68.

SOLI (also Pompeiopolis). A town in Cilicia, Asia Minor. The ruins consist of forty-two columns still standing, out of about 200 (mostly fallen) in two rows; FALKENER, *Mus. of Class. Antiq.*, 1851, ii, 280, gives two views in 1844, of this via triumphalis, or via regalis; solid consoles jut out of the shafts for statues. Also some large tombs and sarcophagi; a theatre almost destroyed, 138 ft. inside and 219 ft. outside diameter; and the port; the remains of the town are blocked up by bushes. IRBY AND MANGLES, *Travels*, 1817 and 1818, 8vo., Lond., 1823, p. 508. LABORDE, *En Orient*, fol., Paris, 1838; TOURNEFORT, *Voyage to the Levant*, 8vo., 1741, ii, 213; LEAKE, *Asia Minor*, 8vo., London, 1824, p. 328. BEAUFORT, *Karamania*, 8vo., Lond., 1817. 23. 96.

SOLI (GIUSEPPE MARIA), born 23 June 1745 at Vignola, in the states of Modena. He studied at Bologna, and 1770 visited Rome until 1784 when he was called to Modena, became professor of the new academy and architect to the court. He assisted Barabini of Genoa and Albertoli of Milan in the column raised to Bonaparte in the forum at Milan; designed the church Carboniano near Rome; the casino Bellucci at Vignola; the palazzo for the marchese Carandini at Modena; the casa civile for signor Borelli; three façades and two staircases to the grand duke's palace; a theatre; a hospital and the cemetery at Cento;

the bridges over the Panaro, near Modena, nella via Emilia; over the Reno at Cento; and over the Rubicon, near Rimini. At Venice, 1814 he designed the Fabbrica nuova to the palazzo regio, forming the west end of the piazza of S. Marco, in continuation of the Procuratie nuova, and destroying the façade of the church of S. Geminiano (V. SCAMOZZI). He wrote several treatises in BRANCA, *Manuale d'Arch.*, 16mo., 1789; and died 20 October 1822. CICOGNARA, *Venezia*, fol., 1838, i, 81, pl. 64-8. BRIGNOLI, *Life in MILIZIA, Vite*, Bologna, 1827, ii, 488. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 479. 68.

SOLID. "To work in the solid" is the term used for carving a block of stone, etc. The mitres of mouldings in masonry are worked in the solid, as distinguished from the cut mitres in joinery. "Solid measure" is the same as cubic measure, thus 1728 cubic inches = 1 solid foot; and 27 cubic feet = 1 cubic yard.

SOLID SHOOT. A trough of wood for discharging rain-water from a building.

SOLIMENA (FRANCESCO), born 4 Oct. 1657 at Nocera de' Pagani; became a very celebrated painter and decorator. He designed his own house at Naples, near the "regii studii". His favourite pupil was Ferdinando SANFELICE, who employed the new ornaments in architecture his master invented, in the fronts of several palaces at Naples; and erected a tomb to the memory of Solimena, who died 1747, aged 87, at La Barra, one of his villas, near Naples, and was buried in a chapel he had built in the church of the Dominicans. DE PILES, *Art of Painting*, 8vo., London, 3rd edit. (1754), App. 51-4. 36. 68.

SOLIN. A measure of land; see SOLANDA.

SOLIUM. The warm bath of ordinary use of the Roman baths and so called by CICERO; it was also called *caldæ lavatio* by VITRUVIUS; *balneum* by CICERO; *piscina* or *caldæ piscina* by PLINY and SUETONIUS, as well as *labrum*. It is also supposed to have been applied to the step inside the *labrum*; also called *gradus inferior*, and below the *pulvinus* or seat.

SOLIVE. A French term for a joist, rafter, or similar piece of wood, as formerly used by English writers; thus "Solives and firewood are sent to burn" from Denmark and Norway; BLUNDEVILLE, *Exercices*, 4to., 1597, fol., 259.

SOLL or SALLE. A large room in a paper mill where the paper is sorted, examined, made up into reams, and packed for sending away. R. R. R.

SOLLER; see SOLAR.

SOLLERET; see SOLARIUM.

SOLLING stones. These well-known stones, obtained from Brunswick; are grès schisteux, or grès psammite; and used as paving for rooms and for covering houses; they are common in the north of Germany. The pietra serena, pietra forte, and pietra cicerchina, obtained at Fiesole and monte Rifaldi; all used at Florence, are all varieties of psammites. BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 46. MACIGNO.

SOLMONA. A town in southern Italy. The palazzo del comune is richly worked cinque-cento with pointed windows, one dated 1522. The aqueduct dates 1400. The arched doorway to the ruined church of S. Francesco d'Assisi is one of the finest examples of the style in Italy. The church of Sta. Maria della Tomba has a rose window and doorway of Italian Gothic. The cathedral dedicated to . . . has Gothic portions. Outside the gate to Popoli is the church of S. Paufilio with a good Gothic doorway, and a crypt. The nunziata is a founding hospital. Two miles from the town is the suppressed monastery of S. Pietro Celestino, one of the most magnificent religious edifices of Europe, built with the materials taken from Corfinium, and founded in honour of the hermit Pietro da Morrone afterwards pope Celestin V, 1294. The monastic arrangements are very complete. POPOLI. 23. 28. 50.

SOLOMON; TEMPLE OF; at JERUSALEM. Restorations after the description given in the HOLY SCRIPTURES, and JOSEPHUS, *History of the Jews*, have been attempted by VILLALPANDUS, in PRADI, *In Ezechielum explanationes, etc., ac templi Hierosolymi-*

tani, fol., 1596; and *Geographia Sacra illustrata, etc.*, fol., London (1730?). ORIENTAL TRANSLATION FUND, *History of the Temple*, transl. by REYNOLDS from the Arabic of Imami Jalal-addin al Siuti, 8vo., London, 1836. WILKINS, *Magna Græcia*, intro., fol., Camb., 1807. HOSKING, *Architecture*, in "Encyclopædia Britannica", 1832. RAMÉE, *Hist. de l'Architecture*, 8vo., Paris, 1843, i, 166-76. CANINA, *Ricerche sulla Architettura degli antichi Guidei*, fol., Rome, 1845. T'ANSON, *Observations on the probable Form and Design of the Temple*, read at Royal Institute of British Architects, *Sessional Papers*, 5 March 1849. WILLIAMS, *The Holy City*, 8vo., 2nd edit., 1849. HAKEWILL, *The Temple; Essay, etc.*, 8vo., 1851. THRUPP, *On Ancient Jerusalem*, 1855. FERGUSON, *Hist. of Arch.*, 8vo., 1865. DE VOGUÉ, *Le Temple de Jérusalem*, fol., Paris, 1866. ROBINS, *The Temple*, in THE BRITISH ARCHITECT JOURNAL, for Jan. 1886, with plates of four restorations; BUILDING NEWS JOURNAL, 8 Jan.; and in pamphlet 8vo.

SOLOMONIC ORDER. A term formerly given to the twisted or spiral column used in Italian architecture, as in the retablo in Burgos cathedral put up by archbishop Vela in 1575; FORD, *Handbook*, 8vo., London, 1855, pt. ii, 845; and in the porch to the church of S. Mary at Oxford, 1637, attributed to H. Holbein and to I. Jones, but is by N. Stone. The emperor Titus is stated to have brought from Jerusalem some marble spiral columns which he placed in the temple of Peace; one was removed to the chapel of the crucifix, the first on the right hand on entering. RAPHAEL in one of his cartoons has designed the porch of the temple with spiral columns in compliance with this story. At S. Sabina, on the Aventine, is a hall between the church and the cloisters of the monastery, in it are spiral columns, possibly dating about 1587. SPIRAL.

SOLOZANO (MARTIN DE), a native of Santa Maria de Haces, in Spain; about 1500 worked at Toledo cathedral; and 1504 commenced the completion of the cathedral at Palencia (begun 1321), but dying 1506 it was completed by J. de Ruesga. 66. 68.

SOLOTHURN; see SOLEURE.

SOLPIE ROOF. A term used in Lancashire for a LEAN-TO roof. SKEELING.

SOLSONA (anc. Setelsis, Setelix, or Celsona). A town of Cataluña in Spain. The old castle is square with round towers at the angles. A strong wall with nine towers and three gates encompass the town, which was made a bishopric in 1593. The cathedral dedicated to the Assumption of the Virgin, having one nave, was erected about 1187; an episcopal palace, and two squares, one being colonnaded, deserve notice. 28. 50. 66. 96.

SOLUBLE SILICATE; see RANSOME; SILICATE; and SILICATE PAINT. ARCHITECT JOURNAL, 1851, ii, 64. BUILDER JOURNAL, 1859, xvii, 664. CIVIL ENGINEER, ETC., JOURNAL, 1859, xxii, 372. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1862-3, p. 157.

SOLUS or SOLUNTUM. A city near Palermo on the north coast of Sicily. Traces of two ancient paved roads; some capitals, friezes, etc., with ruins of walls of two temples on the summit of the hill; several cisterns, sepulchres, and fragments of sculpture, are found. FASO DI SERRADIFALCO, *Sicilia*, fol., 1842, v, 60-7, pl. 36-42. SALEMI PACE, *Sol., le rovine di una antica città del monte Catalano*, fol., Pal., 1872. 23. 28.

SOMA. At Alexandria, in Egypt, was the mausoleum of the Ptolemies, which held the body of Alexander the Great, and was so called. The present building called the tomb of Alexander is not on the site of it. 23.

SOMAROBIVA; see AMIENS, in France.

SOMBIGO (BARTOLOMÉ); see ZOMBIGO (B.).

SOMER; CROSS SOMER; Breast somer or BRESSUMER. A "Somer stone", the bottom end of the parapet to a gable. "Somertrees and great joists", 1648, in HUNTER, *Hallamshire; Sheffield*, fol., 1819; new edition by Gatty, 1869, p. 114.

SOMMERING. The radiating joints of an arch are so called by old writers. Also written "summering". SKEW-BACK.

SOMMERMANN (MATTHAUS), is the same as M. BOEHLINGER of Ulm. 68.

SOMNATH, or Pattan Somnāth. An ancient town near Bombay, in Hindostan. It is celebrated for its temple to the Hindu god Siva, which stands on the site of an earlier edifice sacked by the sultan of Ghuznee *cir.* 1040, and then razed by the Mahometans. The gates of the original temple, which were carried off by sultan Mahoud 1024-6, and erected on his tomb at Ghuznee, were restored 1842 to Somnath by lord Ellenborough, after Ghuznee had been taken by the British. *The Gates, Letter and Illustrations*, by C. J. RICHARDSON, 4to., 1843, from the *ARCHÆOLOGIA*, xxx. These "sandal wood gates" are now decided to be of the Deodar pine. ROYAL ASIATIC SOCIETY *Journal*, 1834, v, 106. HUNTER, *Imp. Gazetteer of India*, 8vo., 1881. ILLUSTRATED LONDON NEWS, 1845, ii, 183, *Inside and Outside Views*. 50.

SONDLET; properly SOUDLET.

SONNIN (ERNST GEORG), born 1709 at Perlen (Prignitz); settled 1750 at Hamburg, where he skilfully set upright three of the towers, as also that of the old cathedral, which last was taken down early in XIX century. He designed 1751-62 the great S. Michael's kirche with its tower 456 ft. high, in the Neustadt; the spire was not completed until 1778 (FABER states 1762-86); it holds 2,000 persons; it suffered in the great fire of 1842. At Reluigen in Holstein is a rotunda by Sonnin, who died in 1794. 68.

SOO-CHOO; see NINGPO, in China.

SOOMAROCKOF. A native of Russia; 1759 designed the theatre at MOSKWA in imitation of the one he had built at St. Petersburg.

SOONDRA; a very strong timber; see HERETIERA.

SOORKEE. A mortar used in Hindostan, made of pounded brick ground up with KUNKUR lime; 2 of soorkee to 1 of lime is very good. Sand is not used.

SOOT (Fr. *noir de fumée*; *suie*; Ger. *russ*; *flatterruss*). That portion of fuel which escapes combustion, and is carried up and deposited in a chimney. Pulverised charcoal condensed from the smoke of wood or coal fuel. The soot of coal, of wood, and of oil, all differ in their composition; from the latter is made lampblack and Chinese India ink. Coal soot must never be used in mortar or to plaster as it will spoil everything with which it comes in contact. Bricks used in flues and smoked, and re-used, must have the stained side turned inwards or it will work through the plastering; BUILDER *Journal*, 1846, iv, 465; xiv, 508; xvi, 209. 14.

Schomburg's patent "soot and spark interceptor", August 1884 consists of two tubes set in a wide circular chamber, and between them is an inverted cone to which are attached four blades. The smoke rising is thrown out to the larger chamber and the heavier particles of soot fall down. It is said to be largely used throughout Germany and Austria. Moriarty's patent spark arresters are used to many of the locomotives and other engines on the English and other railways.

SOOT BLACK. This is a poor colour, but often used for painting black draperies in oil. 13.

SOPENA (JOSEF DE), a native of Liendo near Burgos, who designed and executed the principal cloister of the collegio mayor de S. Ildefonso, at Alcalá de Henares. He died 1676. 66.

SOPHA; see SOFA.

SOPHITE. An old way of writing SOFFIT.

SOPHRONISTERIUM. Among the ancients, a house of correction, or workhouse, where slaves by the private authority of their masters were confined and kept at hard labour for some offence. It was likewise called *ergastulum*. 13.

SOQUETI (.....), 1477 with Alveringe, raised the portal of the cathedral at Aix; the latter executed the lower part up to the apostles. MAURIN, *S. Sauvveur*, in LANCE, *Diët.*, 1872.

SORBIODUNUM; see SARUM.

SORELLA (SIMEONE), of Venice, was *proto* or architect of the Procuratía di Sopra; was one of the many architects who 1587

submitted a design, of three arches, for the bridge of the Rialto; 1590 began the church of S. Benedict; 1595 church of S. Lorenzo; and other edifices. CADORIN, *Pareri*, 8vo., Ven., 1838, p. 81; 180. SELVATICO, *Venezia*, 8vo., 1847, p. 364. 68.

SORIA (GIOVANNI BATTISTA), born 1581, was a pupil of G. B. Montanó, and of the Borromino school. He designed at Rome for card. Borghese, the façade to the church of *Sta. Maria della Vittoria (designed by C. Maderno), being very similar to the façade of Sta. Susanna (RUBEIS, *Insignium Rom. Templ.*, fol., 1684, pl. 70); also that to S. Carlo alli Catinari (a Greek cross designed 1612 by R. Rosati; the dome is one of the highest in the city; RUBEIS, pl. 50; LETAROUILLY, *Edifices de Rome*, fol., 1855, iii, 715, pl. 350); 1623 the church of S. Agato in Trastevere, restored and decorated for card. Borghese; 1633 the porticoes and façade of *S. Gregorio magna for card. Scipio Borghese, considered his best work, which lead through a court with porticoes to the church itself, finished, or rebuilt, 1734 by F. Ferrari (LET., pl. 163, p. 360); 1628 the portico or the church of *S. Giovanni Grisognono (LET., iii, 703; pl. 343); and the church or portico of *Sta. Caterina di Siena in the monte Magnanapoli. These * four are given in ROSSI, *Il Nuovo Splendore*, fol., 1686, books i-iii. Soria engraved the plates to the books of his master Montano, 1625 and 1628. He was president of the academy of S. Luca; and died 22 Nov. 1651, and was buried in the church of S. Luca, at Rome. 3. 12. 25. 42. 68.

SORIA (LOPE and ANDREO). The former was 1419 master of the works to king Carlos at Tudela; and the latter worked at Sanguesa, in Navarre. 66.

SORIA (MIGUEL DE), 1611 designed the church for the monastery of Villaviciosa, at Odon, near Madrid, for conde de Chinchon; and the church del Carmen Calzado at Madrid. He died 28 October 1638. 66.

SORMANO (PACE ANTONIO), also a sculptor, of Como, 1536, did the subterranean chapel to the church of the Madonna di Misericordia, near Savona. 37.

SOROS. The Gr. for a sepulchral chest. A fragment of a leg of a *soros* at Athens, is given in INWOOD, *Erechthreion*, fol., London, 1827, p. 145, pl. 29; it resembles one at Scopelo, given in STUART, *Athens*, fol., 1816, iv. There are several in the British Museum besides the sculptured one from Xanthus. SARCOPHAGUS.

SORRENTO (Anc. Surrentum). A town and seaport near Naples. It has ancient walls and towers; the antiquities are now considered to be mere names, except the piscina, repaired by Antoninus Pius (138-161), and still serving to supply the town, which is the see of an archbishop. The cathedral to SS. Filippo e Giacomo Apostoli, has an episcopal throne and canopy. The church of S. Antonio has a crypt, and there are five other churches. The *sedile* of the Angevine period (1265-1434), is now the museum. A statue of Tasso, born at Sorrento, has lately been put up. *Description* by MOLIGNANO (signor Cesare), in British Museum, Add. MS. 9056, Plut. C xxxi A. SAINT NON, *Voyage Pitt. de Naples, etc.*, fol., Paris, 1781-6, iii, 180-6. ANASTASIO, *Luc. in Surr. Eccles. Civil. Antiquitates*, 4to., Rome, 1731-2. *The Old Town*, BUILDER *Journal*, 1865, xxiii, 706.

28. 50. 96.

The black lava obtained here is used at Naples for staircases, window and door dressings, etc.

SORTANT ANGLE. The same as SALIENT ANGLE.

SOSTRATUS. A statuary mentioned by PLINY (34, 8, 19; and 36, 18, 1) as a contemporary of Lysippus in Olymp. 114. THIERSCH considers he is the same as SOSTRATUS, the architect of Cnidus, son of DEXIPHANES, who commenced the lighthouse on the island of Pharos, at the harbour of Alexandria, by order of Alexander, B.C. 332-3; carried out under Ptolemy Soter, B.C. 312-283; and completed under his successor Ptolemy Philadelphus, who died B.C. 246. It was repaired by Ammonius by order of the emperor Anastatius (A.D. 491-518); *Anthologia*, iv, 28. SULLIG, *Dict. of Artists*, 8vo., London, 1836. SOCIETY OF DILETTANTI, *Ionian Antiquities*, iii, mentions a "pensilis ambulation" as by Sostratus, as a hanging garden terrace (or a balcony?).

PLINY, xxxvi, 12 or 18; STRABO, p. 791. LUCIAN, *de Hist. Conscrib.*, 62. SHARPE, *History of Egypt*, 8vo. (Bohn), 6th edit., 1876. 3. 25. 68.

SOUADIEH; see SELEUCIA PIERIA, in Syria.

SODAK or Soudag, formerly Soldaia (anc. *Athenaeon*). A ruined fortress in the Crimea, near the monastery of S. Georges. The Genoese held it 1365; retaken by the Turks about 1473. The style of the church, now a mosque, is the same as the most ancient in the Crimea. Plan, etc., in DUBOIS DE MONTPEREUX, *Voy. autour de Caucase*, etc., 4to., and fol., Paris, 1839-43; v, 323; 351-3; pt. ii, pl. 45, 64; and pt. iii, pl. 29.

SOUDELET; Sowdele; and Soudlet in error; now SADDLE BAR. The horizontal iron bar in a tall window opening to which lead lights are affixed; the "tiraunt" passes through it. These bars 1331-2 were charged at 2d. per lb., for S. Stephen's chapel, Westminster; BRITTON and BRAYLEY, *Ancient Palace*, 8vo., Lond., 1836, p. 165-6. SMITH, *Antiq. of Westm.*, 4to., London, 1807, p. 196-7. 16. 17. 19.

SOUFFLOT (JACQUES GERMAIN), born 1709 (not 1713 or 1714 as usually stated), at Tracy, near Auxerre, was the son of a merchant. He went to Rome, where he obtained admission to the French academy, and remained in Italy three years. The commissioners of the town of Lyon applying to the academy for an architect, probably to succeed S. F. de la Monce, Soufflot was recommended. He there designed the dome and the great altar (not by Servandoni) to the Carthusian church; 1749 with sieurs Roche, *In loge des changes* or the exchange, now a protestant church (plate by Bellicard); 1737-50 the great wards of the hôtel dieu, the front of which is 176 toises in length (a large plate of it) and was destroyed 1793 (TENON, *Mémoires sur les Hôpitaux de Paris*, 4to., Paris, 1788, p. 32); these are all shown in the margin of a plan of Lyon, 1784, by Daudet et Joubert. He went to Paris, where 25 Nov. 1749 he was made a member of the royal academy of architecture (succeeded by P. A. Paris, the *eloge* by P. T. Bienaimé), after which he went to Rome, and 1750 visited Postum, being the first, as it is said, to publish the ruins there and at Tivoli, but the former had been engraved by ANTONINI, *La Lucania*, 4to., Naples, 1745-7; 1795-7. Returning to Lyon, he 1754-6 designed the theatre (rebuilt 1829-30 by Pollett and Chénard) with the elliptic *salle* for 2,000 persons (FERCUSSON, *History*, iii, 465); and there erected several private dwellings. In 1755 he succeeded L'Assurance jun. as *contrôleur* of the works at Marly; and de l'Isle as *contrôleur* at Paris. After a competition, he for king Louis XV 1757-8 commenced the church of S. Geneviève, of which the king laid the first stone 6 Sept. 1764; Soufflot was the first architect to change the plan for a church from a Latin to a Greek cross. It was carried up under his direction till his death, at which time the arches and pendentives to the dome were formed. Rondelet, his pupil and assistant with him during the construction, and then with Brébion, designed the dome 1786-90, which has three vaults of masonry, and as the piers failed, he 1806-12 substituted others. In 1761 Q. de Quincy had the direction of the works, its destination being changed from that of a church to a public monument—the Panthéon; RONDELET, *Mém. Hist. sur le Dôme*, 1797, new edit., 1814. ISABELLE, *Edifices Circulaires*, fol., Paris, 1855, p. 130-7. PATTE; GAUTHREY; and others wrote upon the subject. (LEGRAND ET LONDON, *Descr. de Paris*, 8vo., 1808, i, 109. WOODS, *Letters*, 4to., London, 1828, i.) The 22 columns of the portico are 5 ft. 6 ins. diam. and 58 ft. 5 ins. high; the interior is 282 ft. long and 238 feet wide; the interior diameter of the dome is 62 ft. (69 Engl. ft.); the eye of the lower vault 29 ft. 5 ins. diam. is 178 ft. above the floor: all dimensions in French feet, and from RONDELET. In 1757 he received the order of S. Michel, and was appointed architect du roi.

In 1756 he designed the treasury and great sacristy of Notre Dame at Paris (DUMONT, *Recueil*, fol., Paris 1764, 14 pl.); destroyed a part of the archbishop's palace of XII cent.; joined on the south side of the choir a ponderous building which crushed the buttresses; and 1771 destroyed the middle pier, etc., of the

door in the west façade for the convenience of processions (DALY, *Revue Gén.*, ix, 16; GUILHERMY, *Descr. de N. D.*, 8vo., Paris, 1856). In 1757-80 he was architect to the Louvre (CLARAC, *Musée*, etc., 8vo., Paris, 1841, i, 660). In 1770 he designed the hospital at Maçon; at Mans, the église de la Visitation; 1775 the rustic château d'Eau in the rue l'Arbre sec; 1775 the école de droit in the place de Panthéon; the orangery of the château de Ménars, near Blois; the hôtel of the duc de Lauzun, at Roule near Paris (on the bank of the river Brenta, near Venice, according to MILIZIA); a château at Chatou, near S. Germain en Laye, for Bertin, the minister of Louis XVI; the *guichet* de Marigny near the Louvre; and the eight pavillons serving as shops on the pont neuf destroyed 1854.

On 8 Nov. 1760 he was made associé libre of the academy of painting and sculpture at Paris: 1776 commissioner and general superintendent of public buildings, succeeded by C. A. Guillaumot; member of the academy of S. Luca at Rome; and of the société royale at Lyon, which institution has many *mémoires* by him. E. A. Petitot and J. B. Rondelet were pupils; T. Loyer (died 1807) worked at Lyon with him. He inaugurated about 1750 the immature "style de Louis XVI", as shown in plates of BLONDEL, *Constr.*, 8vo., Paris, 1777; and is considered with Servandoni to have done much to introduce the purer style of the antique; and also to have collected drawings of Gothic edifices in France, (DALLAWAY, *Anecdotes of the Arts*, 8vo., London, 1800, p. 32; and COCKERELL, *Lecture* in 1846). He died 29 August 1780 (not 30th, or 29 August 1781 as often stated), therefore aged 71 (not 67), hastened by the vexations caused by the attacks upon him in connection with S. Geneviève.

A set of thirty plates of Soufflot's drawings of the ruins at Postum, were published 1764 by G. P. M. DUMONT; 4 pl. were engraved by J. MILLER, fol., London, 1767; also for MAJOR, *Postum*, etc., fol., London, 1768; these were repeated by J. de Varennes, 4to., 1769, in a French translation. DUMONT, *Elev.*, etc., de quelques Edifices de France et d'Italie, dessinés par feu Soufflot, fol., Paris, 1781. BREWER, *Palaces*, 4to., London, 1810, p. 318. Q. DE QUINCY, *Vies des Arch.*, 8vo., Paris, 1830, ii, 337, with plan and elev. of S. Geneviève. JAL, *Diet. Critique*, 8vo., Paris, 1867. LANCE, *Diet. Biog.*, 8vo., Paris, 1872. 1. 3. 25.

SOUFFLOT LE ROMAIN, a nephew of the above, designed 1786 the hôtel Montholon, boulevard Montmartre, at Paris; KRAFFT ET RANSONNETTE, *Maisons*, etc., à Paris, fol., Paris (1802), pl. 67; the country house of mons. d'Epinay, at Sceaux; KRAFFT, *Arch. Civile*, fol., Paris, 1812, pl. 16. In 1794 he had charge of the works at the church of S. Geneviève. He died in 1802. LANCE, *Diet. Biog.*

SOUGH. A term used in Lancashire and the north of England for a drain. A "sough grate" is the holed sink stone having a rim round all in one piece. In mining, an adit or level for carrying off water.

SOUL; or "nucleus" as in VITRUVIUS. The first rough figure made in the forming of a statue in sculpture. 4.

SOUND. VITRUVIUS, v, 8, describing the dissonant, circumsonant, resonant, and consonant places. ACOUSTICS. ISACOSTIC CURVE. ECHEIUM or acoustic vases. The vocal tone extends farther than the speaking, and hence the advantage of chanting in all religious assemblies and tones in street cries. Every room has its keynote in which the voice will be heard clearest at any point if spoken evenly and not too loud. It is recorded of Saunderson, the blind mathematician of Cambridge, that he knew the size of a room by sound, and the distance he was from the wall; and if he had once walked over a pavement in a court or piazza, which reflected sounds, he knew, when he went again, the exact place he was in. Engert's apparatus for steel plates for the improvement of sound, is described in the *Journals* of 1879-80.

The following publications are in addition to those named *s.v.* ACOUSTICS. HIGGINS, *Philosophy of Sound*, 8vo., 1838. BALL, *Wonders in Acoustics, the Phenomena of Sound*, 8vo. (1870). BREWER, *Sound and its Phenomena*, 12mo., London, 1854. TYN-

DALL, *On Sound; a Course of Six Lectures*, revised, etc., 2nd edit., 1867, 8vo., 4th edit., 1883. LORD RAYLEIGH, *Theory of Sound*, 8vo., 2 vols., 1878. BLASERNA, *Theory of Sound in its Relation to Music*, 8vo. SPON'S *Arch'ts and Builder's Pocket Book* for 1881. LAIRDNER, *Handbook of Natural Philosophy*, 1851. *Acoustics*, in Chambers's Educational Course, 12mo., 1850. COLLEY CIBBER, *Apology*, 12mo., Lond., 1756, i, 230-320, effect of alterations. ROGER SMITH, *Const. of Buildings in Reference to Sound*, read at Arch. Association, *BUILDER Journal*, 1858, xvi, 773; 791; 822; and *BUILDING NEWS Journal*, 1858, iv, 1154; *On Sound*, at R.I.B.A., 1860-61, and B. J., xviii, 815; 821-2; 833; with *Acoustics of Public Buildings*, 12mo. (Weale), 1861. SCOTT, *Construction of the Albert Hall*, 22 Jan. 1872; STATHAM, *Architecture—in Reference to Sound*, 20 Jan. 1873; both read at Roy. Inst. of Brit. Arch'ts. *MUSICAL REVIEW*, ii, 413-4.

Gropings in Practical Acoustics, in *BUILDER Journal*, 1850, viii, 411; 421. ISACOUSTIC CURVE. REID, at SOCIETY OF ARTS, xiii, 208. WIRE.

Examples of Transmission of Sound are given in *BUILDER Journal*, i, 535; viii, 496; prison walls, v, 618. Leeds Town hall, xvi, 752; xvi, 892. S. Paul's cathedral, xvii, 112. Gothic roofs, xv, 172; xviii, 821-2. BEEJAPORE. Theatre at PARMA. Cathedral of S. JOHN, Antigua. Liverpool, Philharmonic hall, and the concert room attached to S. George's hall. *BUILDING NEWS Journal*, Theatre at Royal Institution, 1858, iv, 1178; various, 1204; and xvii, 73; SAUNDERS, in 1879, xxvii, 410. In the salle des secrets at the observatory at Paris, if a person whisper against one of the pillars he may be distinctly heard by another at the opposite pillar though not by anyone in the centre of the room; PLANTA, *Paris*, 14th edit., 1825, p. 206. Was this the same effect as at the alcoves on old Westminster bridge?

SOUND or SOUNDING BOARD; or CANOPY. It is called "Type" in LANGLEY, *Builder's Treasury of Designs*, 4to., 1740, p. cxii. (It. *cielo d'un pergamo*; Span. *toranvoz*; Fr. *abat-voix*.) A canopy over a speaker's desk, intended to diffuse the sound of his voice through a church or other room. To the pulpit in the church of S. Sepulchre, Snow hill, London, is a sounding-board in the shape of a large parabolic reflector, about 12 ft. in diameter, which extends over the preacher; and by collecting the pulses of sound and reflecting them into the body of the church, assists the voice. It is constructed of ribs of mahogany, so arranged that the grain of the wood radiates all ways from the centre, and varnished. This was put up by Mr. Elliot; GODWIN, *London Churches*, 8vo., London, 1838, i. An "acoustical canopy" was put up at the Free S. Luke's church, Glasgow, invented by James Wylson; NEWLANDS, *Carpenter's Assistant*, fol., London, 1860, p. 190; pl. 83a. An instructive paper on this form of sounding-board is given in *BUILDER Journal*, 1860, xviii, p. 822, showing that it would never be safe to build the end of a room of that shape—in a long room not very wide, a reflector might be very useful. It refers to *Description of a Parabolic Sounding-board erected in Attercliff Church*, by the rev. John BLACKBURN, 1829; and at other places. PHILOSOPHICAL TRANSACTIONS, cxviii, 361; SOCIETY OF ARTS, *Transactions*, xlviii, 192. ECCLESIOLOGIST *Journal*, 1868, xxix, 353. A hyperbolic sounding-board, 10 ft. diam., was put up about 1857 in S. Paul's cathedral; ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1858-9, p. 65-6. SMITH, *Acoustics of Public Buildings*, 12mo., 1861, s. v. Reflectors. At the Royal Albert hall, South Kensington, on 18 Jan. 1877 a small suspended parabolic sounding-board was tried by G. Godwin, F.R.S., to aid single speakers; it was considered to be successful, the voice being distinctly heard in all parts of the hall, but in certain lines there was an echo; *BUILDER Journal*, 1877, xxxv, 93. It is seldom used, as speakers and reciters have the impression that it shades the face.

On Sounding-boards, *BUILDING NEWS Journal*, 1869, xvi, 560.

1. 2. 14. 19. Sheepskin strained on a wood frame suspended from the ceiling; B. J., 1850, viii, 477. Specimens of pine planks, *Abies taxifolia*, were exhibited in 1851 from Austria, used for sound-

ing-boards for musical instruments; a section above 3 ft. diam. had 470 concentric rings; *Reports of the Juries*, 151.

In 1158 king Abdelmumen Ben Aly on his march gave the signal to his army to move by a large *atambor* or drum of a round form made for that purpose. It was constructed of a finely sounding wood and had fifteen eils in circumference; the colour was green enriched with gold; the sound from it could be heard at the distance of half a day's march when the air was serene and still; CONDE, *Arabs in Spain*, 8vo., 1854, ii, 487.

SOUND-HOLE; air hole or tower light. The openings in the belfry or ringing-chamber windows filled with tracery, but not glazed, are found in some districts, especially Norfolk, and there commonly called "sound-holes"; they sometimes occur in the Decorated period, but are more common in Perpendicular work. RICKMAN, *Attempt*, edit. 1848, p. 152-3; 220; with cuts.

SOUND-PROOF CONSTRUCTION. An arrangement to prevent the transmission of sound. "Paid for borde naille and lome for tering and amending of his chambre flore that dust should not falle downe upon them that sittes and occupies his halle"; temp. Edward IV (1460-83); *Harl. MS.* 4780, p. 23-4, xii, in British museum.

The commonest mode in a floor is to fix fillets 2 ins. by 1 in. about 4 ins. below the top edge of the joists and along the sides of each of the joists, to carry rough $\frac{3}{4}$ in. boards split up; on this boarding pugging is laid, formed of good rough mortar mixed with chopped hay or straw about $1\frac{1}{2}$ in. thick. In summer this should have a month to dry and set properly, and in winter six weeks, as it should be quite dry before the floor boards are laid, or the plastering to the ceiling under, be done. Pugging of mortar and straw has been found in Wales 400 years old, quite perfect. In north Lancashire, a floor was found filled in with long moss, dried, and mixed with dry lime rubbish, which should be well screened and well mixed with the moss, no part being left unfilled; B. J., 1864, xxii, 302. Lime and hair is less liable to crack, especially if a liquid composition be poured over it, producing an air-tight mass; *BUILDER Journal*, xv, 222. Fine lime is recommended in preference to ashes, or to sand which lies close but is heavy. Cork chippings or shavings were found in an old house in Gloucestershire. Chalk lime and coke breeze; dry ashes with lime and hair; lime and burnt ballast, in the proportion of 1 of lime to 7 of ballast. Cockle-shells, as in some of the floors at Hampton Court palace, where the layer was fully 2 ins. thick: they must be perfectly dried in an oven, when work could be continued at once; *Journal of the CLERK OF THE WORKS ASSOCIATION*, 1884, p. 170, etc. A very bad result ensued in a case about 1854 where the upper floors were formed of iron girders carrying brick arches, upon which were laid small fir joists, the spaces between, about $2\frac{1}{2}$ or 3 ins. deep being filled in with cockle-shells; not set in before the rooms were ready for habitation. COLLING, *How to prevent the Passage of Sound through Floors and Walls*, in *BRITISH ARCHITECT Journal*, 21 April 1882, p. 181, who declares that ordinary pugging is a conductor of sound, and suggests other arrangements. COUNTER-LATHING. PUGGING. DEAFENING. FLOOR.

"Floor tiles" were made about 1825 to supersede boarding, by J. W. HIORT; laid on strong fillets. Two courses of plain tiles well ground in and squeezed down, were used at 32, Hyde Park gardens. Bricks have also been carried on such fillets. The joisting has to be fixed to suit the length of such materials. At King's Bench walk chambers, Temple, and the Carlton Club house, Pall Mall, by sir R. Suirke, all the floors were to have "sound tiles" between the joists laid upon feather-edged fillets pointed and bedded with hair mortar. Each tile was rounded, rising about 2 ins. in an external width of 10 ins., was 14 ins. long, and weighed about 6 lb.: the fillet was 2 ins. deep. Thin slate has been used; *BUILDING NEWS Journal*, 1871, xx, 57. A strip of thick felt, or of cork, nailed on the top of the joist, is recommended in addition to pugging, but not always with success. Or by screwing ceiling joists $2\frac{1}{2}$ ins. by 3 ins. to the underside of the joists, putting a washer of india-rubber (or

of cork) say 2 ins. diam. and so thick between the two timbers as to leave a half-inch space between them when screwed up. Or counterjoists $2\frac{1}{2}$ ins. by 3 ins. might be fixed on the top of the main joists.

Slag-wool or silicate cotton is considered to render floors and partitions sound-proof, when filled with this material, in the form of bricks or otherwise. Even when covered before lathing it is of great benefit. Asbestos millboard has also a similar effect, secured to the studwork, or to a panelled or boarded partition, and canvased and papered. Hitchin's fire-proof plastering or fibrous pugging slab is useful.

To make a floor perfectly sound-proof, it should be formed as a double floor, which is expensive. In bridged floors, timbers of small dimensions can be used, affording the best means of applying lord Mahon's (afterwards STANHOPE'S) mode of preventing fires; ELMES, *Lectures*, 8vo., 1821, p. 270, read at the Royal Society; PHIL. TRANS., 1778, p. 884. In an instance 1841 where the height of a room 13 ft. by 14 ft. 6 ins. permitted of it (it had an 18-inch-deep cove), and the flooring over could not be disturbed, a false ceiling was inserted of joists boarded, canvased, and papered, while above them it was lathed and plastered, and on this a layer of sawdust was placed about 2 ins. thick. A man-hole was left in the centre until the last, this was lessened in size, and covered as well as possible, and then closed and decorated with a flower.

Patent fire-proof floors are said to be great conductors of sound, except when floored and counter-ceiled; BUILDER *Journal*, xv, 75, 222; 1876, xxxiv, 1033. At Bradford, the Prince's theatre is placed upon the top of the Star music-hall, in Manchester road; the floor separating them is formed of a solid and compact mass of iron, concrete, and sawdust, about 4 ft. 6 ins. thick. The ways of ingress and egress are kept altogether apart; 1876.

Sound through walls. Brick not being so good a conductor as cement concrete, is recommended for all internal or partition walls, even if the external are made with concrete. For ordinary houses a lime concrete wall 9 ins. in thickness would not pass sufficient sound to be considered a serious evil, and the plastering on both sides would also assist in deadening it. It has been suggested to batten and lath and plaster concrete partitions to prevent sound passing through, but battened walls are not desirable; probably hollow partitions would be better, but this incurs more trouble with concrete than with brick; the only practical ways being to insert taper wood cores, 1 or 2 ins. thick, and of convenient size for withdrawing them as the work proceeds; or the insertion of sheets of dry hair boiler felt in the middle of the concrete. To stiffen the felt, it might be tacked to thin rough boards of convenient lengths, both boards and felt being built in.

To prevent sound in *flues* in prison walls; BUILDER *Journal*, 1847, v, 618. The roof of the Inquisition chamber at AVIGNON is shaped like an inverted funnel.

To prevent transmission of sound through a glass partition: plate glass double glazed, *i.e.*, leaving about a quarter of an inch between the glasses, is recommended; they should be set in white lead to prevent dust getting into the space, which would obscure the light and be difficult to clean off. The room will also be warmer; BUILDER *Journal*, 1863, xxi, 675.

SOUP KITCHEN; see KITCHEN.

SOURCE; SOUSE and SOUSTE. Supposed from the Fr. *sous*. Thus "sous" and "corbel sous" occur in the contract, 18th Richard II (1394-5), for "reforming" Westminster hall; BRAYLEY AND BRITTON, *Palace*, 8vo., 1835, p. 437, referring to the corbels from which spring the timber arches of the roof. In the charges for S. Stephen's chapel, Westminster, 1330-1 and 1345-7, "pieces of marble for sources" are named; SMITH, *Antiq. of Westm.*, 4to., 1807, p. 207; 209. PUGIN, *Specimens of Gothic Arch.*, 4to., 1822, *Gloss.*, p. 20. 16. 17. 19.

SOURCE of water, or conduit. Fontaines de la Trinité (Morbihan), and de S. Gohennoux (Finisterre), given in DALY,

Revue Générale, 1856, xiv, 318-9. Others in NODIER ET TAYLOR. *Foy. Pitt.* (Champagne), fol., Paris, 1843-5, at Sacy, and S. Loup. ARTESIAN WELL CASTELLUM, CONDUIT. FLOW OF WATER.

FOUNTAIN. HYDRAULICS. JET. SEDEEL.

SOUR GUM TREE; see NYSSA: and GUM TREE.

SOURIS (MONT) STONE. This material was used in the construction of the dome of S. Geneviève (the Pantheon), at Paris, by J. G. Soufflot. WARE, *Vaults*, etc., 1829, p. 25.

SOURSADDEL-REDEDOS. A term applied 1332, "100 beech boards eight feet long each to cover the soursadel-rededos in the east gable, 6s. 8d." BRAYLEY AND BRITTON, *Palace*, 8vo., 1835, p. 155; SMITH, *Antiq. of Westm.*, 4to., Lond., 1802, p. 185. The word "rededos" here is presumed to be a corruption of *arrière dos*. SOURCE. 19.

SOSA (EMMANUEL GAETAN DE), of Lisbon, born 1738, was a pupil of G. Thomas; he succeeded M. Vicente as architect to the Infante, and to E. Renand dos Santos as architect of the public works. As architect to the patriarch and the three military orders he conducted several public edifices and restorations. He designed the churches of the Incarnação, and of the Dominicans, and the royal chapel of Bemposta; his own house, and that of Domingo Mendes, the tower of the royal chapel of Ajuda, near Belem, for which palace he modified the plans of F. X. Fabri (died 1807), continued by A. F. Rosa, and others. He died 1802, aged 64. His son Francisco Antonio succeeded him in the latter appointments, and died in 1814 at Lisbon, aged 60. CYRILLO, p. 222. RACZYNSKI, *Dict.*, etc., de Portugal, 8vo., Paris, 1847, p. 332. 68.

SOUSE; SOUSTE; see SOURCE.

SOUTERAZI. The Turkish name for the system "balance of water" for conveying water in pipes across a valley, in place of a raised structure. For those at Constantinople, see *Detached Essay*, Aqueduct. ALLGEMEINE BAUZEITUNG for 1853, pt. i; pl. 523-8. DALY, *Revue Générale*, 1840, i, 129. Kaste-Kadjar ruins of aqueduct, in HOMMAIRE DE HELL, *Voyage en Turquie*, etc., 4 vols., 8vo. and fol., 1854-60, pl. 73.

SOUTERRAIN. A French word sometimes used by English writers for underground works, as grottoes, caves, basements, and other SUBTERRANEAN constructions. 25.

SOUTHAM LIME; same as BLUE LIAS; and LIAS STONE.

SOUTH DOOR; see SUTH-DOOR. A small door into the chancel (PRIEST'S DOOR) was usually on the south side, as it led to his residence erected on that side of the church. The door or porch into the nave for the congregation was also on the south if not on both sides.

SOUTHOWRAM STONE; see ELLAND EDGE and HALIFAX.

SOUTHWELL (Anc. Ad pontem). A town in Nottinghamshire. It has long been appreciated for the minster or collegiate church dedicated to S. Mary the virgin, which was made cathedral in 1884. It was brought into public notice by the reference made to it in the *Report of the Commission on Stone*, 1839, wherein it is stated to be "erected of magnesian limestone (MANSFIELD QUARRY) similar to that of Bolsover Moor; and in perfect condition. The choir which is XIV cent. and built of a stone similar to that of Mansfield, is generally in good condition." The nave, aisles, transepts, three towers, some doors, enriched north porch, and gate of the close, date in the earlier half of XII cent.; the eastern portion is very fine Early English; the chapter house, early Decorated or XIV cent. (view in BUILDER *Journal*, 1857, xv, 263; and proposed alterations, 1876, xxxiv, 795); the organ screen with some stalls are later; the large west window with other insertions are Perpendicular. The walls of the original apse of the aisle were found in 1873; ASSOCIATED SOCIETIES, *Reports and Papers*, 1873, p. vii. The eagle and candlestick are from Newstead abbey; (JEWITT, *Reliquary*, i, 200). The repairs have been carried on steadily since about 1856 by the aid of John Gregory and his labourers; the re-roofing, restoration of the spires and chapter house, were contracted for and finished 1884, under the direction of Ewan Christian, who 1886 is about to put in stalls and restore the

screens. BUILDING NEWS *Journal*, controversy, 1876, xxxi, 311, 354, 380, 401, 405; 1881, xii, 424; 861 and plates; xlii, 44, 127, 268, 342, 372. RASTALL, *Hist., etc., of Town and Church*, 4to., 1787. FOWLER, *Entrance to Chapter House*, fol., Winc., 1809. CLARKE, *Collegiate Church*, 4to., 1837. DIMOCK, *Architectural History*, in JOURNAL OF BRITISH ARCHAEOLOGICAL ASSOCIATION, 1853, viii, 265-303; and DIMOCK, *Illustrations*, fol., 1854. ARCHITECT *Journal*, 1877, xvii, 401, and view restored. BRITISH ARCHITECT *Journal*, 1885, Oct., 146. C. H. SMITH, *Lithology*, 4to. (Weale), 1845.

SOUVETT. A term used in a document relating to Hengrave hall, Suffolk, wherein 1538 John Eastawe, mason, agrees "to make all the inner court wth a fyne souvett", defined as a fretted band or cornice, in GAGE, *Hengrave*, 4to., 1822, p. 42.

SOVANA; see SUANA, in Etruria.

SOVEREIGN; see HALF-SOVEREIGN; PITCHING; SETS.

SOVERO or SEVERO (ALBERTO), of Cremona, 1491 was employed with others to complete the cathedral, of which the façade towards the Piazza grande was then in hand. 57. 62. 68.

SOW. The large sand-mould into which some metals are run in smelting, from whence are smaller ones called PIGS. An inventory at Boston, Lincolnshire, of xv cent., has "2 tubs, 2 sowes (large tubs)"; PARKER, *Dom. Arch.*, 1859, iii, 152. 1709 "directing and overseeing the sows to drain water", *Diary of R. Thoresby*, 1674-1724, 8vo., 1830, ii, 51.

SOWDELL; see SOULET.

SOWTENT (EDWARD), surveyor, repaired the castle at Nottingham from 2nd to 12th of Elizabeth, 1559-70; British museum, *Arch. MS.* 368, No. 130.

SOYLE; Sowl; Sole; see SOIL; and CILL.

SOYNERE or SUNERE (HEINRICH), and magister Henricus, is noticed 1248 as "petitor structure majoris ecclesie Colon.", being probably a competitor for, or undertaker, or the first *baumeister* at Cologne cathedral. He died 1254. FORSTER, *Geschichte der Deutschen Kunst*, i, 152. FABURA, *Beiträge zur Geschichte der Baumeister des Kölner Doms*. KÖLNER DOMBLATT, 1843, p. 42, 50, 66: 1844; 1849-50. See KETTWIG (G. VON).

SOZI (BERNARDINO); also called Bino, born 1520, was one of the best architects of his time at Perugia, where he designed the great altar in the cathedral. He died 1590, aged 70. 42. 68.

SOZORNEY (Severinum), or Zévérino; opposite NIKOPOL, a town of Thrace, now of Bulgaria; and Scala Gladova or Kladova in Servia; Poridza or Povez in Temesvar. The walls of Kladova were built by the Romans round the town of Egeta, and from here the emperor Trajan, A.D. 104, caused a bridge to be erected by Apollodorus of Damascus, over the Danube to the present Wallachian town of Turou Severinulu (Turn Severin); the foundations of the pillars are to be seen at low water, for it was destroyed by the emperor Hadrian (117-138). It had twenty-one arches of 170 ft. span; the piers 60 ft. wide and 150 ft. high; the bridge being 300 high; its ends were defended by forts. BEATTIE, *Danube*, 4to., London, 1844, p. 222-4. GIBBON, *Decline, etc.*, 8vo., London, edit. 1853, i, 515; iv, 337. Xiphilinus, in *Vita Trajani*. 25.

SOZZO, and Soczus; see ALBINA (G.) of Palermo.

SPA. A very fine black marble is now obtained in the Upper Garonne; also at Bergama, and the Pyrenees at Mount Majou. CLARAC, *Musée du Louvre*, 8vo., Paris, 1841.

SPAAR (.....), designed 1843 the caserne de gendarmerie at Bruxelles; 1843 the new church at Molenbeek; and 1850 the pseudo-Gothic church at Schepdael.

SPACE (Fr. *espacement*). The proper term for the half-landing or quarter-landing of a staircase; usually called pace. HALF-SPACE. The CRENEL of a battlement was sometimes called a space, as in 28 Henry VIII. 16.

SPADE. An implement used by excavators and others. It is made of several shapes according to the nature of the soil, or for special purpose, as for digging trenches, etc. The shovel part of two Roman oak spades, found in Shropshire, are given by WRIGHT, in ILLUSTRATED LONDON NEWS, 1856, xxix, 352; 504.

ARCH. PUB. SOC.

"Spyddell" a small spade, xiv cent. "Spads"; when made of wood and edged with iron they were said to be "ferro ligatus"; SURTEES SOCIETY, *Finchale Priory*, 1837, p. 448. SPIT.

SPAIN; ARCHITECTURE OF. Spain was first colonised by the Phœnicians; some of whose structures may be seen at Antequera; walls of large polygonal stones at Tarragona; dolmens, etc., at Alava, Arios, Sierra de Sejos, Luque, etc. They were followed by the Carthaginians. After the disasters of Hannibal in Italy, the Romans, having gained the ascendancy, subdued the native tribes and Spain became a Roman province; 360 cities were counted within its limits. The most interesting antiquities are at Ronda, Malaga, Antequera, Jerez, Italica, near Seville, Cazorla near Jaen, Merida, Talavera la vieja near Toledo, Avila, Leon, Clunia near Burgos, Numancia, near Soria, Cabeza del Griego near Ucles, Elche near Alicante, Murviedro near Valencia, Segovia, Tarragona, Yécla; bridge at Alcantara, Salamanca, and Merida; walls at Lugo, Coria, and Astorga.

The Latin Byzantine style from v to end of x century. Early in v cent., hordes of Suevi, Goths, Vandals, and Alans entered the country, and spread themselves over Old Castile, Asturias, Galicia, and Andalusia, committing great havoc. About the end of vi cent. they were vanquished by the Visigoths headed by Leovigild, who established a dynasty lasting over 150 years. Of the former epoch the following are good examples: the church of S. Roman de Hornija, near Toro, 646; S. Juan de Baños, 661; some caps in Cordova cathedral; churches at Toledo; fragments at Toledo and Merida; and the armoury at Madrid. Later works comprise: churches of Sta. Maria Naranco and S. Miguel de Lino, near Oviedo; Sta. Cristina de Lena; the churches of S. Pedro and S. Pablo at Barcelona; etc.

The Moorish style, viii to xv cent. In 672 the Saracens from Africa first made their appearance at Gibraltar; entered Toledo 711, the first and second leaders conquered up to the Asturias, when Pelayo of royal Gothic extraction founded the kingdom of Asturias in 737. The kingdoms of Navarre and Aragon were founded; of Castile and Leon; and 1072 Alonso VI of Leon held Asturias, Leon, Galicia, and Castile; Aragon, Asturias, Biscay, and North Galicia, were never conquered by the Moors. In 1085 Alonso III of Castile aided by Rodrigo di Vivar (the Cid) reduced Toledo, etc.; other monarchs pressing the Moors they retired into the mountains of Granada and there founded 1248 a new kingdom. John II of Aragon dying in 1479 the two kingdoms of Castile and Aragon with Sicily became united under Ferdinand (died 1516) and Isabella (died 1504). In 1492 they expelled the Moors, who were finally expelled under Philip III (1598-1621). Their works are seen best in the mosque at Cordova, ix cent., and in that at Toledo; part of the church of Santiago de Peñalba, a Christian building in the Moorish style; the alhambra at Granada; the alcazar at Seville and at Segovia; 1200 the puerta del Sol at Toledo; and the aljaferia at Zaragoza.

The Romanesque style of xi and xii and part of xiii cent. After 1175 the church at Benevente; and Lugo cathedral; doorway of Santiago cathedral; 1100-75 the old cathedral, cloister and chapter house at Salamanca; others in Asturias, Galicia, Castile, Aragon, and Cataluña; the cloisters at Gerona and Tarragona are unrivalled; and 1125-75 the cathedral at Zamora. Its introduction into Spain is attributed to the influence of the three French queens of Alonso VI (1072-1109).

The Pointed style, xiii to part of xvi cent. The general terms used in Spain for this style were *Cresteria*, *Mazoneria*, or *Obra nueva*. Later it was called *stilo gotico germanico* and *gotico moderno*. Juan de Olotzaga is considered to have introduced it, *cir.* 1400, at Huesca cathedral. Orense cathedral is rich and beautiful and of granite, its elaborate detail is only found in buildings erected perhaps one hundred years later in the north of Europe: the occurrence of the arch executed 1219, struck from two centres, seems to confirm the opinion of the gradual development of mediæval architecture from the south towards the north.

The *Mudejar* or Mosarabic, a mixture of Christian and Moorish art; the best works were in XIV cent., as at Toledo, Seville, and Granada; the synagogues at Toledo and Segovia; the casa de Pilatos at Seville; palace of Mendoza at Guadalajara; archbishop's palace at Avila; and casa de Mesa at Toledo.

The finest cathedrals in the Pointed style are at Toledo, Leon, and Burgos; those at Salamanca and Segovia, built in late Gothic, were begun in XVI cent. LLAGUNO states (i, 128), that "the great Gothic architects of Spain were M. Carpintero, the two Colonias, D. de Siloe, and J. del Cruz." The Spanish cathedrals present either the French chevet with a circle of chapels, or an apsidal aisle round the altar, and opening on chapels, with an eastern chapel, which, if the east end is square, is the Lady-chapel; if circular or octagonal, as at Burgos and at Batalha, a tomb-house. The transepts are ill-defined. The stalls of the clergy are ranged along the west end of the choir (which is shut off from the nave by a wall), and ranged westward of the transept, the whole space under the lantern, *cimborio*, being railed in and unoccupied. The sanctuary, *capilla mayor*, contains only the high altar. Leon, commenced 1199, terminates in a chevet with five chapels. Burgos, of the XIII cent., has lateral chapels attached to the nave, two western towers, a central octagonal lantern, and octagonal eastern chapel, like that at Murcia. Toledo, commenced at the same period, is of five aisles, with an eastern chapel. Seville is a parallelogram, with five aisles and lateral recesses and an eastern chapel.

The three styles Moorish, Flamboyant, and Renaissance are combined in the chapel of the cathedral at Sigüenza; and D. de Riancho, 1530 erected the Gothic sacristia de los calices, the plateresque sacristia mayor, and the Italian chapter house, etc., at Seville. The Revival or *Renaissance*, also called in Spain *Greco-Roman*, from end of XV cent. Carlos I of Spain, and V as emperor of Germany (1516-55) united the houses of Spain and Austria. The fine works comprise the portals of Santa Cruz at Valladolid and Toledo; the university, Sto. Domingo, casa de las Conchas and Salinas at Salamanca; San Marcos at Leon; casa de ayuntamiento at Seville; at Valladolid, Zaragoza, Burgos, etc. Alonso Berruguete (b. 1480, d. 1561) was the originator of the *stilo plateresco*, a combination of the Gothic and Italian; Juan de Herrera of the strictly classical manner under Philip II, called *stilo herreriano*; H. de Egas, 1504-14 was one of the first to exhibit a knowledge of the *Greco-Roman* style; 1527 the palace at the alhambra by P. Machuca. The cathedral at Granada; part of the alcazar at Toledo; the monastery of the Escorial. This style succumbed to that of the several Churriguera's 1689-1746, which if in France would be called *rococo*; it was continued by the Garcias de Quiñones, Tomás, P. de Ribera, 1720-50 (who filled Madrid with a number of designs that have become the opprobrium of Europe), T. Gabilan, T. de Jauregui, Galuci, Sani, M. Garcia, A. M. Valenciano, Lucas and his son Josef Blanco, and A. Roman.

By the peace of Utrecht 1713 Spain lost all her European dominions beyond the peninsula; and after 1788 lost most of her colonies. Philip V (1700-46) introduced the French Carlier, Marchand, and Brachelieu, and the Italian Juvara, Sachetti, R. Frascina, and Sermini, probably the teachers of V. Rodriguez who designed and directed so many works of palaces, etc., in all the provinces of Spain as to be termed the restorer of Spanish architecture. 1750 was the epoch of the French academical Italian style. 1752-72 A. Gonzales Velasquez as professor at Madrid, lectured on the merits of picturesque architecture. 1770-1800 Vicente Gasco and pupils at Valencia, had the reputation of being the restorers of architecture in the kingdom. Amongst the edifices of this part of the period, are the Transparente or cathedral at Toledo; retables of S. Esteban at Salamanca, of Cartuja at Granada, and at Madrid; façade of the hospicio; the palace and convent of Salesas; the museo and observatory, the two latter at the end of the last and beginning of present century. Then ensued the French invasion of 1808 with all its disasters to Spanish buildings.

To the above few edifices might be added the more elaborate account given in GWILT'S *Encyclopedia of Arch.*, 1837; and 1876: the article in QUARTERLY REVIEW, No. 154, 1846, p. 496-526; and those given in this Dictionary, s. v. ARAB; ITALIAN; MORESCUE; POINTED; RENAISSANCE; ARCHITECTURES.

The following list of architects who have practised in Spain is derived from LLAGUNO y Amirola and CAEN BERMUDEZ, *Noticias de los Arquitectos y Arquitectura de España*, 4 vols., 4to., Madrid, 1829, giving an account of about 1,100 names, of more or less merit; the larger number are included in this Dictionary; STREET, *Gothic Arch. in Spain*, 8vo., London, 1865, refers to many; the more important are as follows:—

ROMAN.	A. de Covarrubias.	M. Carrera.
C. Severus Lupus.	D. de Siloe.	G. and N. Churriguera.
C. Julius Lacer.	J. de Vallejo.	F. Ascondo.
Apuleius.	J. de Badajoz.	S. Bonavia.
MOORISH.	Rod. Gil (de Hontanón).	F. Carlier.
Fioda; see Tioda.	P. and Luis Machuca.	E. Marchand.
Viviano.	B. Bustamante.	L. Brachelieu.
Said Ben Ayoub.	L. de Vega.	V. Rodriguez.
1000.	A. de Berruguete.	J. Hermosilla y Sand- oval.
Gever, Jaber or Hever.	M. de Gaiusa.	T. V. Tosen.
P. de Dios (Deus Tam- ber and Vitamben).	Fernan Ruiz I, II, and III.	A. Gonzalez Velasquez.
Cassandro Romano.	P. de los Valdeviras.	D. de Villaneuva.
Florino de Pituenza.	el maestro J. del Cruz.	M. Fernandez.
1100.	G. de Vega.	J. de Castañeda, and Vallego.
A. Garcia.	F. de Villalpando.	J. J. Nadal.
el maes. Raymundo.	J. de Ribera Rada.	S. J. and J. S. Bort.
Raymundus.	J. B. de Toledo.	I. de Ibero.
P. Cebrian.	F. Becerra (America).	J. Marquet.
el maes. Mateo.	J. and A. de Maeda.	F. Sabatini.
el maes. Jordan.	J. de Herrera.	M. de Vierna.
el maes. Tomás.	A. de Villacastin.	T. Cayon de la Vega.
B. Sanchez.	M. de Ureca.	F. Subiras.
1200.	L. de Escalante.	V. Gasco.
maea. P. Perez.	P. de Tolosa.	A. Gilibert.
P. de Penafreyta.	J. de Minjares.	J. M. de Aldehuela.
Jayme Fabra.	D. de Alcantaro.	P. Cerneno.
1300.	J. de Valencia.	F. Sanchez.
el maes. Hali.	J. B. Monegro.	M. Machuca y Vargas.
Juan Rodriguez.	G. Ordóñez.	A. de Ulloa.
D. Fernandez.	N. de Vergara.	J. de las Cabezas.
B. de Valfigonza.	F. de Mora.	J. P. Arnal.
J. Franch.	1600.	A. de S. Josef Pontones.
A. Martinez.	D. Theotocopuli.	J. Prats.
J. and R. Alfonso or Alonso.	P. de Lizaragarte.	A. Sanz.
1400.	D. and F. de Praves.	J. de Sagarvinaga.
J. de Olotzaga.	J. Gomez de Mora.	E. Lopez Durango.
P. Balaguer.	G. B. Crescencio.	1800.
G. Sagrera.	el Hermano F. Bautista.	L. Cintora.
J. and S. de Colonia.	A. Carbonel.	M. Reguera Gonzalez.
P. de Gumiell.	Fr. J. de la O.	F. Ibero.
An. de Egas (de Brus- elas).	Fr. L. de S. Nicolas.	R. Duran.
Jimon or Ximon.	J. de Villareal.	J. Garcia.
Alvar Gomez.	M. del Olmo.	D. de Tomás.
M. Carpintero.	T. Ardemaus.	J. Soler.
1500.	1700.	J. de Villaneuva.
H. de Egas.	F. de Artiga.	M. M. Rodriguez.
J. de Arandia.	F. Hurtado Izquierdo.	S. Perez, 1825.
J. de Alaya.	J. Churriguera.	In 1846.
Alf. Rodriguez.	N. Tomás.	D. Gomez de la Fuente.
Ant. Egas.	P. de Ribera.	N. Pascual de Colomel.
J. Campero.	F. Juvara.	A. Alvares.
J. Gil (de Hontanón).	J. B. Sachetti.	A. de Zavaleta.
P. de Mazuecos.	C. Frascina.	Custodia Moreno.
P. Garcia de Mazuecos.	P. Sermini.	J. M. Inclán.
1879 R. Contreras, Granada; 1882 M. Belmá, Madrid; have been the only two H. and Cor. members of the Royal Institute of British Architects.	T. M. Albarran.	

Among the *juntas* of architects mentioned by LLAGUNO, are Gerona held 1416; 1470 (i, 261); Salamanca 1512 (293); 1523 (283); 1588 (ii, 63); Simancas 1574 (114); Seville 1540 (ii, 180); 1694 (iv, 66); and Zaragoza 1500 and 1520.

The first work on *Architecture* published in Spain was by D. SAGREDO, *Medidas del Romano*, 4to., Toledo, 1526. A. de

RESENDE, *Livro de Arch.* (Alberti); and *Duos Livros de Aqueeductos*, cir. 1540-73. F. de VILLALPANDO, *Tercero y quarto libro de Arg.* (Serlio), fol., Toledo, 1563. V. SALVÀ, *Los diez libros de Arch.* (Alberti), 4to., Madrid, 1582. ARPHY y VILLAFANE, *De varie com. para la Escultura y Arch.*, fol., Seville, 1585-7. F. PRAVES, *Lib. I. de la Arg.* (Palladio), Vall., 1625. LOR. DE S. NICOLAS, *Arte y uso de Arguit.*, fol., Mad., 1633. ANON., *Compendio de la Carpenteria en blanco y Tratado de Alarifes.* A. BARBOSA DA SYLVA, *Tratado de Arch. e Arith.*, about 1674. T. ARDEMANS, *Declaracion, etc.*, sobre las Ordenanzas de Madrid, etc., 1719. A. G. BRIZGÜZ y BRU, *Escuela de Arquitectura Civil*, 4to., Valencia, 1738. J. CASTANEDA, translated Perrault's abridgment of *Vitruvius*, 1761. BENAVENTE, *Elementos de toda la Arch. Civil* (by C. Rieger, 1756), 4to., Madrid, 1763. J. ORTIZ y SANZ, transl. *Vitruvius*, 1787; and transl. *Palladio*.

SARATEGNI y MEDINA, *Est. sobre la Epoca Celtica en Galicia*, Ferrol, 1868. VILLAMIL y CASTRO, *Ant. prehistoricas de Galicia*, Madrid, 1868. FERGUSSON, *Rude Stone Monuments*, 8vo., 1873. WARING, *Stone Monuments*, fol., 1870. DURO, in *La Academia*, 1877, p. 184.

Normans and Moors.—FORD, *Handbook*, 3rd edit., 1855; p. 164, 403, 413, 513, 639. GIRAULT de PRANGEY, *Essai sur l'Architecture des Arabes*, 1842. MURPHY, *Arab. Antig.*, fol., 1813. LOZANO, *Antigüedades Arabes en Esp.*, 1804. GRANGERET DE LAGRANGE, *Les Arabes en Espagne*, 8vo., Paris, 1824. LE BON, *Civilisation des Arabes*, 8vo., Paris, 1884, p. 269-307.

Pointed style.—STREET, *Gothic Architecture in Spain—during several journeys through that country*, 8vo., 25 pl. and 100 illust., London, 1865; cheaper edit., 1874; reviewed in *BUILDER Journal*, 1865, xxiii, 165, 213; 172: by ASHPITEL, in *THE FINE ARTS QUARTERLY REVIEW*, 1867, p. 251: and *GENTLEMAN'S MAGAZINE*, 1865, i, p. 676.

Renaissance, etc., style.—WARING AND MACQUOID, *Architectural Art*, fol., 1850, pl. 52-9. QUILLIET, *Les Arts Italiens en Esp.*, ou *Histoire des Artistes Italiens qui contribuèrent à embellir les Castilles*, fol., Rome, 1825.

General.—MORALES, *Las Antigüedades de Esp.*, 1575. AN-
DRADES, *Varias Antig. de Esp.*, 4to., 1614. PERELLE, *Les Plans et Profils des prin. Villes, etc.*, de Catalogne, avec la Carte de chaque Gouvernement, 116 pl., 1660. MEUNIER, *Vues des Palais*, fol. (1665). ALVAREZ, *Les Delices de l'Esp.*, 12mo., 1741. COLMENAR, *Les Delices de l'Esp. et du Portugal*, 5 vols., 18mo., Leyden, 1707. FLOREZ, RISCO, and others, *Espana Sagrada*, 49 vols., 4to., 1754-1865. ANON., *Noticia historica de las Nobles Artes, P., E., y A. en Valencia*, 4to., 1772. PONZ, *Viaje de Esp.*, etc., 8vo., 1776. WELLS, *Pict. Antig. of Spain*, 8vo., 1846, p. 312-435. SWINBURNE, *Travels through Sp.*, 1779; 1787, p. 242; and *Pict. Tour through Sp.*, fol., 1806. TAYLOR, *Voy. Pitt. en Esp.*, etc., 4to., 1826 and 1832. BOURGOING, *Sp. its Topography, etc.*, 4 vols., 8vo., 1808. LABORDE, *View of Sp.*; descr. itin. of each Province, 6 vols., 8vo., 1806; 82 pl., fol., 1806-20. D'AVILLIER, *Sp.*, transl. by J. THOMSON, with Doré's illustrations, 4to., 1855; 1874; 1881. BAXLEY, *S. Art Remains*, 8vo., Lond., 1875. CAVEDA, *Ensayo historico de Arquitectura en Esp.*, 4to., Madrid, 1848; transl. by HEYSE and KUGLER, 8vo., 1858; reviewed in *BUILDER Journal*, xvi, 862. CUENDIAS and FÉREAL, *L'Espagne Pittoresque, Artistique, et Monumentale*, 25 pl., 8vo., Paris, 1846. O'SHEA, *Guide to S.*, 8vo., 1865. LOCKER, *Views in S.*, 4to., London, 1824. BEGIN, *Voy. Pitt. en Esp. et Portugal*, 8vo., Paris (1850). PARCERISA, *Recuerdos y Bellezas de Esp.*, 8vo., 1839, etc., a vol. to each province. VIVIAN, *Secrecy, etc.*, fol., 1839. STIRLING MAXWELL, *Annals of the Artists of Sp.*, 8vo., 1848. CARDERERA y SOLANO, *Iconografia Espanola*, coleccion de Retratos, Estatuas, Mausoleos, etc., de Reyes, etc., desde el siglo XI hasta el XVII, Span. y Franc., 2 vols., fol., 92 pl., Madrid, 1855-64. WIDDRINGTON, *Sketches*, 2 vols., 1834; and *Spain and Spaniards*, 2 vols., 1844. SIMONS, *Spanien in Schilderungen*, fol., Berlin, 1880.

Architectural.—VILLA AMLT y ESCOSURA, *L'Espagne Artistique et Monumentale*, fol., Paris, 1842-9, 3 vols. SPANISH GOVERN-

MENT, *Monumentos Arquitectonicos de Espana*, 83 parts, folio, Madrid, 1859-80. HOPE, *History of Architecture*, 8vo., London, 1824. LANDSCAPE ANNUAL for 1837 and 1838, by D. Roberts, and for 1839, by J. Holland. FERGUSSON, *History of Architecture*, 8vo., London, 1867. M. D. WYATT, *Archit.'s Note Book in Spain*, 4to., 1872.

D'AVILLIER, *Recherches sur l'Orfèverie en Espagne au Moyen Age et la Ren.*, Documents, etc., 19 pl., 4to., Paris, 1878; and his *Histoire des Juiferies Hispano-Moresques*, 8vo., 1861. HURLSTONE, *Lecture at ARCHITECTURAL EXHIBITION*, *BUILDER Journal*, 1863, xxi, 345; 464. WARING, *Notes of an Architect in Spain*, idem, 1852, x, 37, 168, 180, 197. *Modern Architects in Spain*; idem, 1846, iv, 32. *On Spanish Architecture*, idem, iv, 170-2.

SPALATO, not SPALATRO, as formerly written (anc. Aspalathus; Lat. Spalatum; Slavonic, *Split*). A seaport near Salona, in Dalmatia, situated on the Adriatic. It is well known for the palace erected 285-305 by the emperor Diocletian; 598 ft. long facing the harbour, by 705 ft., enclosing rather more than 8 acres. The four great towers at the corners stand intact, as are the walls; of the four central gates, the northern, or porta Aurea, is nearly perfect. On the south side were the emperor's private apartments and two temples. The place of the cathedral was the colonnade of the palace; its rose-coloured granite columns all exist. The temple to Jupiter was vii cent. turned into a church, and later cathedral up to 1829; the columns are on pedestals; it has a curious dome. The temple to Æsculapius is now the baptistry of S. Giovanni. The campanile 1360 erected with old stones, 173 ft. high by Nicholas Tvardi, is a bold work. ADAM, *Palace, etc.*, fol., Lond., 1764. GIBBON, *Decline, etc.*, 8vo., edit. 1853, i, 464-6. GAILHABAUD, *Palace, in Monuments*, 4to., Paris, 1842-52, i. CASSAS, *Istrie, etc.*, fol., Paris, 1802, p. 94; 120-134; pl. 44, etc. HERDER and GITELBERGER, *Mittelalter Denk.*, etc., fol., 1856-60. HUBSCH, *Altchrist. Kirche*, fol., 1858, etc. LANZA, *Palace*, fol., Trieste, 1855. NEALE, *Notes—on Dalmatia, etc.*, 8vo., 1861. SPON AND WHEELER, *Travels in Asia Minor, etc.*, 8vo., 1678. *Restorations, Ruins, and Discoveries*, in *BUILDER Journal*, 1846, iv, 51, 328; 1847, v, 363; 1883, xlv, 202, 442; and 1850 by prof. F. CARRARA for the Austrian government; *Top. e Scavi di Salona*, Trieste, 1850. 1. 2. 3. 14. 15. 23. 25. 26. 28. 50. 96.

A Venetian tower dated 1403, is perhaps the one above noticed; the fort Grippe, erected 1645-70 by the Venetians; three parish churches; the old lazaret house end xv cent., called "las cassas"; and the archbishop's palace; are mentioned among the later works. SALONA. SIGNO, the former AEGUAM. STRANGEFORD, *Eastern Shores of the Adriatic*, 8vo., London, 1864, p. 223; modern town 231-9. FREEMAN, *Historical Essays*, 3rd series, 8vo., London, 1879, p. 61; and *Neighbour Lands*, 8vo., 1881. R. H. R., *Rambles in Istria*, 8vo., 1875, p. 85. PATON, *Highlands and Islands of the Adriatic*, 8vo., 1849.

SPALCHING; see FLUSH. SPALTED was used in reference to the broken edge of a drum of a column at the Holborn viaduct, 1869.

SPALL. A rough lump of granite as sent from the quarry to places to be broken up for macadam paving: Guernsey spall.

SPAN. A measure of length; by PLINY, = 10.368 Engl. ins. The geometrical foot of the beginning of xvi cent. = 9.8175 ins.; TAYLOR, *The Great Pyramid*, 1859; *BUILDER Journal*, 1859, xvii, 818. CUBIT. Also the chord, width, or diameter of an arch, or arched opening.

SPANDREL, SPANDREL (Fr. *piece d'angle*; tympan of VIOLLET-LE-DUC, *Dict.*). An irregular triangular space formed between the outer curve or extrados of an arch, a horizontal line from its apex, and a vertical line from its springing. It forms a large field for ornamentation. The word is used in WREN, *Parentalia*, fol., p. 297, 357, as well for arches as for vaults. "Spaundre" occurs in the contract 1393 for raising the walls of Westminster hall; and "splandrellys", in the repairs 24 Henry VIII at the Tower of London; BAYLEY, *Tower*, 4to., London, 1824-5. 16. 19.

GUL, phool, kutaifa; Hindoo term for the spandril ornaments. SPANDREL BRACKETING. The planks filling in the spandrels of the curves in mediæval roofs are called *madrier* by VIOLETT-LE-DUC, *Diet.*, who gives it also to the wood struts or cantilevers beneath. Also a cradling of brackets of wood fixed between one or more curves, each in a vertical plane, and in the circumference of a circle, whose plane is horizontal. It is used for saving weight of material in coves, cornices, and such projections in plasterer's work. NICHOLSON, *Diet. of Architecture*, gives several examples. 1.

SPANDREL WALL. The wall built upon the haunch of an ARCH.

SPANI (BARTOLOMEO CLEMENTE), probably designed 1512 the palazzo Pio, or ducale, now called the castello, at Carpi; 1518 the façade of the priory church of S. Giacomo; and the highly praised portal of the palazzo Donelli (afterwards Cerreti?); he did many fonts, tombs, etc.; and died 1525. TIRADOSCHI, *Notizie*, 4to., Modena, 1786, p. 160-178, 399; who notices his son GIROLAMO, and grandson PROSPERO, as stated s. v. CLEMENTI.

SPANISH. A name formerly given to the sea-coal ashes or "laystall stuff", mixed with the clay of which bricks are made, saving 8 chaldron of coals out of 11 to the burning of 100,000 of bricks; DEFOE, *The Complete English Tradesman*, 8vo., 1732, 3rd edit., i, p. 27-8. ARCHITECT *Journal*, 1855, July 31, p. 72.

SPANISH ARCHITECTURE; see SPAIN; architecture of.

SPANISH BLACK. Carbon of cork. It was first invented by the Spaniards, and bought from them. 9, 13.

SPANISH BRICKWORK. The Cuban brick is 10 ins. by 5 ins. by 1.5 ins. thick; the usual calculations are given by YOUNG, in *Spans' Arch.*, etc., *Pocket Book* for 1881, p. 413.

SPANISH BROWN, Ruddle; or Tiver. A red ochre. "An earth brought from Spain; the best is of a deep bright colour and free from stones or grit. It grinds well if done carefully. It is used for 'priming' wood work, on account of its cheapness, its drying well, and receiving all other colours laid upon it. It is a perfect horse-flesh in colour; is the natural shadow for vermilion; and has several varieties when mixed with white"; JOHN SMITH, *Painting in Oyl*, 12mo., 1676; 1687; 1705. 9.

SPANISH CHESTNUT; see CASTANEA. It is said to have been used in the very rich ceiling of the chapter house xv cent. at Canterbury. The roof of Westminster hall is of oak, and not chestnut as usually stated; Royal Inst. of Brit. Architects, by PAPWORTH, *Sessional Papers*, 1857-8; and by BLASHILL, 1878-9.

SPANISH HEAD QUARRY, not far from Castletown, Isle of Man. A flagstone obtained from rocks of the older Silurian date. Though soft and slightly elastic, and worked with great facility, it is very durable, as shown by the Runic monuments in various parts of the island. It is specially quarried of suitable scantlings for lintels, for which it is much used. 71.

SPANISH IRON. This material was used 1331 5 Edward III at Westminster. "To Robert of S. Alban's for 3 cwt. for bars and iron work at east gable, at 4s. 8d. per cwt.; and to Walter de Bury, smith, for making the iron into bars at 4s. per cwt." About half of the quantity "was wasted in the fire". BRAYLEY AND BRITTON, *Palace, etc.*, 8vo., 1836, p. 153. In the first half of xviii cent., the English smith employed Spanish iron for large articles, as anchors, anvils, and thick bars; but although it was a tough and soft iron many workmen refused it because it was so unevenly wrought in the bars that it cost them much labour to smooth it, and because it was subject to red-sear, i.e., to crack between heat and cold, and therefore needed to be carefully tended at the forge. Spanish iron is now 1886 being reintroduced.

SPANISH OCHRE; same as Orange ochre. A very bright yellow ochre burnt. The ancient red, called minium, vermilion, or cinnabar, was first obtained from near Ephesus, and then from Spain. A spurious armenium, or blue, was made of a particular sand found in Spain, and was dyed. POMPEII, ii, 53-4.

SPANISH ORDER. A new order invented by S. LE CLERC, a French painter, in his *Traité d'Architecture*, 4to., Paris, 1714; transl. by W. CHAMBERS, 8vo., London, 1732. ELMES, *London in XIX cent.*, 4to., 119.

SPANISH TOWN or SANTIAGO DE LA VEGA. The capital of the island of Jamaica. It is the seat of government, and having the usual public offices and law-courts. The cathedral has a Gothic chancel 50 ft. by 50 ft., erected 1849-50 under J. Calvert; BUILDER *Journal*, 1849, vii, 377; 548; viii, 352. 50.

SPANISH WHITE (Fr. *blanc d'Espagne*), or Troys or Troy white. A terrene white, a pure clay, useful for some purposes as in distemper work, but destitute of body in oil; and injurious to many colours in water, as to all colours which cannot be used in fresco. If adulterated with chalk, a few drops of dilute nitric acid will cause it to effervesce, and it is then unfit for working in oil or varnish. PEARL WHITE. Spanish brown and Spanish white appear first about 1700; the common "whiting" now takes the place of the latter in ordinary work. PAPWORTH, *Fir, Deal, and House Painting*, read at Royal Inst. of Brit. Archts., 2 Nov. 1857. 9.

SPANNER. A long handle key to put on to and turn a tap, generally of hot water; also used to gas and water-supply pipes, as it can be removed for safety. Also an instrument, somewhat like pincers, for unscrewing joints of piping, as it obtains a strong grip. Wilson's double-action screw-spanner 1864, has a curved handle and oblique jaws, adjusted by a double-action screw.

SPAN PIECE. The term used in Lincolnshire and other counties for the collar beam of a roof.

SPAN ROOF. A roof where the rafters are framed or cut to a rounded shape; COMPASS ROOF. Also used in contradistinction to a LEAN-TO ROOF.

SPAR. Also sper, a batten; spur; old terms, spares, sparrys, sparres (Fr. *esparre*; Ger. *sparrn*). A north-country term for a rafter. Also a quarter or stud to a partition; SPEARING PIECE. Also a bar to secure a door. SUKTES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 445. In some old documents, doors are frequently said to have been *sparryd* or *sperd*; that is, fastened by means of a wooden bar. In a house at Rotherfield, Sussex, is a large spar of oak, placed in a groove in the wall and drawn across the door at night as a fastening. Such grooves are often found in old buildings. 17, 19.

SPARING. At Bristol it is executed as follows: A good rough coat of plaster is put on the walls and well scored; the floating coat requires a good quantity of hair with it, and is then put on, and whilst wet the plasterer throws on "spar" with his trowel as hard as he can, then presses it with a board, and then joints the work. The spar is washed and screened until it is all uniform in size. The work lasts and looks well for many years when carefully done. DEPRETER. ROUGH CAST. STUCCO. T. S. P.

SPARK. Moriarty's patent spark arrester is 1885 used to the outlet of the fue-pipe of locomotives and engines.

SPARKE (JOHN), mason, 1525-38 constructed the bay windows, and probably the gate-house, at Hengrave hall, Suffolk. GAGE, *Hist. of Hengrave*, 4to., 1822, p. 54. 19.

SPARKS (ROBERT or EDWARD); see PARKE (R.).

SPARTA, sometimes called Lacedæmon. The ancient capital of Laconia and chief city of Peloponnesus, situated on the river Eurotas, now Iri. The only considerable remains of Hellenic works are the theatre, from which Mistra and the surrounding towns have been supplied with stone. It was about 418 ft. diam. (GELL), the orchestra is about 140 ft.; LEAKE says about 450 ft., and that it must have been one of the largest in Greece; DONALDSON, in STUART, *Athens*, fol., 1830, iv, 28; p. 34, note. There is also, a sepulchral chamber of large square stones; the bridge over the Trypitioko, of large single stone blocks reaching from side to side; and part of a causeway of similar construction. LEAKE, *Asia Minor*, 8vo., 1824, p. 322-9; *Travels in the Morea*, 8vo., 1830, gives a full description of the ruins; and *Peloponnesiaca*, 8vo., 1846. DONWELL, *Classical*

Tour, 4to., 1819, i, 174. GELL, *Itin.*, 4to., 1810; or *Morea*, 8vo., 1823, p. 189. BLOUET, *Morée*, fol., Paris, 1834-6, ii, 44, 63, 155. DALY, *Revue Gén.*, 4to., 1858, xvi, 70-2. CLARK, *Peloponnesus*, 8vo., London, 1858. LIVY, xxv, 36, mentions the temple of Minerva as formed of copper; AES. 14. 23.

A marble, amethyst-coloured with well-marked yellow veins, was 1851 obtained from Sparta.

SPARTUM; see KING WOOD.

SPAULED, and SPAWLED or SPALLED rubble; the same as RUBBLE MASONRY. Masonry built of stones rough from the quarry, of all sizes and shapes, with small stones, chips, or spawls, inserted to fill up the irregularities between the larger stones; the faces of the stones are usually roughly dressed with the hammer. The round towers are generally built with this sort of masonry; PETRIE.

R. R. B.

Another variety has the stones varying from 6 to 14 ins.; and is possibly rather more expensive as the joints have to be matched, as in the Roman opus incertum. IRISH (p. 41); KILKENNY.

SPAUNDRE; see SPANDREL.

SPAVENTO (GIORGIO, and maestro ZORZI), engineer, son of Pietro of Venice, was consulted 1496-8 with Giulio Romano (PIPER) and A. Riccio on the loggia and council-house in the piazza degli Signori, at Vicenza; 7 March 1499, as proto dei procuratori of S. Marco, he was desired to repair the ceiling of the great council-room; 1501 the piazza of S. Marco having been cleared from the ruins and the whole façade shown, it was ordered that he should cover it with marble; he presented a model for rebuilding the bridge of the Rialto; it was then repaired, and burnt about 1503; 10 Dec. 1502 he with ser Piero were elected deputies of the college. 1503 designed the tribune or capella maggiore of the church of S. Salvatore (designed by A. Lombardo; altered and completed by T. Lombardo, V. Scamozzi, and G. Sardi); March and Oct. 1505 he presented an account of the cost of the chapel of S. Nicholas in the palazzo of the Salt officials, which was paid 1507-8. He died soon after 1508. ARNALDI, *Delle Basiliche*, 4to., Vicenza, 1769, xxxiii-viii-xl. CADORIN, *Pareri*, 8vo., 1838, p. 145, 156; 165-6. SELVATICO, *Venezia*, 8vo., 1847, p. 169. MAGRINI, *Intorno*, etc., 8vo., Vicenza, 1854, p. 9. 3. 68.

JACOPO, a carpenter, 1566 assisted Sansovino, and on his death 1570 succeeded him as superintendent of the ducal buildings at Venice. 68.

SPAZI (LORENZO DEGLI), or L. Spazo, of Como, was 1391-6 at Milan cathedral, when he returned to Como to commence the rebuilding and continue the works of the nave, 50 ft. wide, of the cathedral. FRANCHETTI, *Duomo di Milano*, 4to., 1821. 68.

SPAZZO (BARTOLOMEO), of Brescia, was one of the masters *cir.* 1660 of B. Fedrighino.

SPEAKING TUBE or PIPE. A pipe for the conveyance of sound from one room to another. It is usually of tin.

SPEAR HEAD; see SPIKE.

SPEARING PIECE. A Somersetshire term for the stud or quarter of a partition; SPAR.

SPECCHI or SPECULI (ALESSANDRO), was a pupil of C. Fontana. He drew and engraved various plates for FALDA, *Il Nuovo Teatro—di Roma*, fol., 1665; and for ROSSETTI, *Studio d'Arch. Civile*, fol., Rome, i, 1702; ii, 1711 gives the Roman foot used by him; and engraved a plan and two elevations of S. Peter's at Rome. He designed the palazzo de' Carolis, later Simonetti on the corso; il porto di Ripetta, if not by C. Fontana (LETAROUILLY, *Rome Moderne*, fol., 1840, p. 155, pl. 10); il sito della Roma trionfante in Campidoglio; alterations to the palazzo Verospi, via del corso, designed by O. Lunghi (FERRERIO, *Palazzi*, fol., 1655, pl. 93; LET., p. 160; pl. 16); the portico to S. Paolo fuor delle mura, partly destroyed by an earthquake, or threatened to fall as he had trusted too great a weight to his ties; and 1721-4 commenced the extensive stabling, etc., for pope Innocent III, over the quarters of the papal guard, soldati rossi, and opposite the palazzo Quirinale, completed by F. Fuga.

ARCH. PUB. SOC.

PASCOLI, *Vite Moderni*, 4to., Rome, 1730-2, ii, 549. NAGLER gives a list of fourteen subjects engraved by Specchi, who he states died 1710, but this does not agree with many of the above dates. 3. 12. 68.

SPECCHIA. The name given near Trani, in Italy, to the conical tower or hut, built of the stones picked off the fields, for shelter to the husbandman and his tools; SHEELING. TOWER. 28.

SPECIFICATION (It. *scandaglio*; Fr. *devis*). The description of how a work is desired to be executed, explaining in detail the materials, quality, thickness, and construction, in addition to the "style" which may be shown by the drawings. *How to Write a Specification*, BUILDING NEWS JOURNAL, 1870, xix, 56. CONTRACT. EXTRA. LIQUIDATED DAMAGES.

General works.—JONES, *The Builder's Vade-Mecum*, 8vo., 1809. WALKER, *Architectural Precedents*, etc., 8vo., London, 1840. DOBSON and GARBETT, *Student's Guide to Measuring*, etc., 8vo., London, 1852-3; another by TARN. BARTHOLOMEW, *Sp. for Practical Architecture*, 8vo., 1840; 1846. STRICKLAND, *Reports, Specif., and Estimates*, U.S.A., pl., fol., Phil., 1826; and text, 8vo., London, 1841. REID, *Surveyor's*, etc., Assistant, 4to., 1848. WIGHTWICK, *Hints to Young Architects*, with a model Specification, 8vo., 1846; 2nd edit., 1860. DONALDSON and GLEN, *Handbook of Specifications; Legal Liabilities*, etc., 8vo., 1860. BLENKARN, *Arch. and Engin. Specifications; Road-making, Sewering*, etc., 8vo., 1865. PEWTNER, *Comprehensive Specifier*, 8vo., 1870. GWILT, *Encyclopædia of Architecture*, 8vo., 1867, and 1876.

Special.—About 346 B.C.; Arsenal at Athens by Philo, son of Execestides; commented upon in BUILDER JOURNAL, 1883, xlv, 369. At Lebadea, architectural contract and specif. of works of repair, for a temple to Zeus; BUILDER JOURNAL, 1877, p. 336; 413; CORPUS INSCRIP. ATT., ii, Pl. I, No. 167; RANGABÉ, *Ant. Hellén.*, ii, 381. B.C. 334-330 contract for repairing and strengthening the Long Walls at Athens; RANGABÉ. A.U.C. 648, i.e., 105, a sort of one found at Puteoli, is given in CAPACCI, *Hist. Neap.*, 4to., Naples, 1771, ii, 326, differing in many respects from the copy in VITRUVIUS, 4to., Udine, 1827, b. iv, c. 6, or ii, pt. i, 217; also PIRANESI, *De Magnif. Rom.*, fol., Rome, 1761, pl. 37.

At Calatayud, a portal, 1525-8 under a very detailed one and contract said to be still in existence; LLAGUNO, *Noticias*, 4to., Madrid, 1829, i, 193. XVI cent. in BAUX, *N. D. de Bourg*, 8vo., 1849, p. 211-34.

RHODES, *S. for building a bridge over the river Shannon, at Portunna*.

Several in LONDON, *Villa*, etc., *Arch.*, 8vo., 1833, § 1129, at end.

HINE, S., with detailed drawing for a labourer's cottage, 4to., 1848.

S. for a small semi-detached villa, in BUILDING NEWS JOURNAL, vi, 9, 33.

S. for a bath and shower-bath, in Tylor and sons' Catalogue, fig. 480.

Will of Henry VI for Eton college; and King's college chapel, Cambridge; and will of Henry VII for his tomb and chapel.

S. for building the carcass of the Lunatic asylum, Old street, in MS. in air John Soane's museum.

Will of Peter Blundell 1599 for school at Tiverton, Devon; in DOLLMAN, *Ancient Domestic Arch.*, 4to., 1858, p. 24.

S. for a suburban villa; BUILDING NEWS JOURNAL, 1869, v, 900.

SPECH HOUSE; see SPEECH HOUSE.

SPECIFIC GRAVITY; see GRAVITY.

14.

SPECKLE and SPECKLIN (DANIEL), born 1536 at Strasbourg, was 1577 architect to the city. The vault of the cathedral being thrown down 2 March 1542, he rebuilt it 1547. He published *Military Architecture* 1589; reprinted Leipsic, 1736; and is recorded as "one of the greatest geniuses that has applied to this art"; his works were mostly destroyed during the wars of Napoleon. In chap. 2 he describes the instrument now called "proportional compasses". He also wrote two volumes on the *History of the City*, which work was in the archives. He died 1589, at Strasbourg. GRANDIDIER, *Essais*, etc., *sur l'Eglise*, 8vo., Stras., 1782, preface, and 226; 341. AUFSCHLAGER, *L'Alsace*, 8vo., Strasb., 1828, i, 142. DIDRON, *Annales Arch.*, 1848, viii, 149. THAUSING, *Life of Albert Dürer*, transl. by EATON, 8vo., London, 1882, ii, 71; 301. 68.

SPECKLED WOOD; see SNAKE WOOD.

SPECULARIS; LAPIS. A semi-transparent substance, a sort

G G

of mica stone obtained by the Romans first from Hispania Citerior, and afterwards found in Cyprus, where it still abounds, Sicily, Africa, Cappadocia, and in Italy about Bologna; PLINY, *N. H.*, xxxvi, 22. It is found in masses of 10 ins. or 12 ins. wide and 3 ins. thick, and readily splits into thin smooth laminæ or plates. LACTANTIUS, *De Opif. Dei*, c. viii, latter end of III cent., mentions the use of glass and of this material; *Pompeii*, by the Society for the Diffusion of Useful Knowledge, 8vo., London, 1832, p. 27-9; 222. *Encyclopædia Britannica*, 8th edit., 4to., Edinb., 1856, x, 658. SALMASIUS is of opinion that *specularis* was a generic term equally applicable to windows of all sorts; NIXON, in ROYAL SOCIETY OF LONDON, *Phil. Trans.*, No. 80, 1, 1758, p. 601. A lapis specularis made of plaster, is noticed in AQUINO, *Vocab.*, 4to., 1734, s. v. Gypsum, p. 112. A sort of white transparent talc is much employed in Russia as glass in windows; VALOIS. ALABASTER. GLASS. PHENGITES. SLAB. 25.

SPECULATIVE MASON. The equivalent for non-operative. One who has been admitted to a "Lodge of Masons", without any intention of qualifying as such, save as respects any esoteric knowledge or peculiar privileges, and the same definition applies to any persons who join other trades in like manner; as explained by GOULD, *History of Freemasonry*, 4to., London, 1883, ii, p. 7; who notices that the first so known as being in the Lodge of Edinburgh in 1600; p. 7, 406, 408, 411, 415; 419 in 1696; 430, 432, 433-4, 436, 444, 447.

SPECULATORIUM. A peep-hole with a grating in a door to look through before opening it. One at S. George's chapel, Windsor, is given in WYATT, *Metal Work*, fol., 1852, pl. 29.

SPECUS, also called *forma*, *cuniculus*, and *canalis structilis*, by the Romans, was a trough of brick or stone, lined with cement, arched over, or covered with flat stones to protect the water from the sun and rain; it was the main part of an aqueduct; as described in *Detached Essays*, Aqueduct, p. 6-7.

SPEECH HOUSE; SPECH, SPEKE, and SPEAK. A room for conversation. CONVERSORIUM. PARLOUR. The court house, now the guildhall, at Canterbury, and the common gaol annexed to it, were each called the speech house, until 26 Henry VI. SOMNER, *Antiq. of Canterbury*, by BATTELY, fol., 1703, p. 66. 17. 19.

SPEETH (PETER), was born 1772 at Mannheim. About 1792 he designed and built a house for ... Schmidt at Frankfurt-sur-Main, which was highly praised; he became architect to prince Leiningen; and to the grand duke Ferdinand of Wurzburg, in which city he restored the *schneid thurm*, the chapter house, and the gate tower in the Zeller strasse; and began the house of correction, finished by the Bavarian government. Speeth accompanied his patron to Florence on his accession to his Italian states; and went to Russia, where 1831 he died. 68.

SPEIER; also written SPEYER, in Germany.

SPEIRA; see SPIRA.

SPEIS (HANS), worked at the cathedral at Regensburg at the same time as W. Roriczer, with whom he was associated in the undertaking which cost him his life. 68.

SPEISET or SPHYS (FRIEDERICH), 1451 *workmeister*, succeeded A. Egl at Ratisbon cathedral and 1465 was followed by K. Roriczer. POPP and BULAU, *Les Trois Ages*, fol., 1841. 92.

SPELO (Anc. Colonia Julia Hispellum; *Lat.* Ispolo). A town near Assisi, in Italy. The porta Veneris, a Roman gate surmounted by three figures outside the ancient walls; numerous Roman remains; traces of an amphitheatre; remains of an arch in the via dell' arco, which CALINDRI states was dedicated to the emperor Marcus Opilius Macrinus; the remains of a third one leading to the monastery at the top of the town; with the casa and so-called tomb of the poet Propertius, died about 19 B.C., are to be seen. Probably the first-named archway, having octagonal towers of perhaps Lombard date, is the one given in SERLIO, *Architettura*, fol., Ven., 1663, p. 142-3. Another is given in LECLERE, *Recueil*, fol., Paris, 1826, pl. 39. The Gothic collegiate church dedicated to Sta. Maria Maggiore; the church of S. Andrea, dedicated 1223; and a later church of S. Lorenzo, are among the more modern buildings. 28. 50. 96.

SPELTER. The ordinary commercial name of ZINC.

SPELTER PAINT AND CEMENT. A patent obtained before 1868 by James Webster. It is put forward as a positive protection to iron from oxidation; as manufactured from the pure metal; as superior to galvanizing; does not give off any nauseous gas or vapour injurious to health; and is useful in salt water. *Use of Zinc or Spelter*, in *ENGINEER Journal*, Feb. 1867. GRANT, *Practical Chemistry*, ii, 290; MALLET, *Pract. Chem.*, xxii, 352; CAVENDISH SOCIETY, i, 364; 365. Report of Committee on Metals 1845 to the Admiralty, in House of Commons Return No. 314, June 1867, p. 76-9.

SPENCE and SPENSE (old Fr. *dispense*). Formerly in England it denoted the buttery or larder; also an eating-room; and is still used in the north of England; also for a country parlour, attached to the kitchen. In some large houses erected about 1800 a suite of rooms was called "the spence"; in some cases it joined the housekeeper's room; perhaps the modern "expense" or wine-cellar; and was devoted to such uses as larder, pantry, closet, still-room, etc.; *BUILDING NEWS Journal*, 1869, Dec., p. 436, 453. The "dispense" room is yet used in London clubs, from whence wine, coffee, etc., are served. 19.

SPENTHARUS; see SPINTHARUS.

SPEOS. An excavation in a rock for a temple (not tomb), in Egypt; as at BENTHASSAN, and at ANOO-SIMBEL. The fine speos Bayt el Welly, of Ramses II, at Kalabsheh, the casts of the great tableaux in which are in the Egyptian gallery of the British museum, is described by EDWARDS, *Up the Nile*, 8vo., 1877, ii, 407, 549.

SPER, spere, SPUR, etc. (*Lat.* sporum, sperum, esperum, etc., as in mediæval documents). This term appears to have had three meanings:—I, a screen (*escrinia*) across the end of hall, as 1538 in GAGE, *Hengrave Hall*, 4to., 1822, p. 42. In the north of England it still denotes any partition within the entrance of a room.

II, in the decoration of royal apartments XIII cent., was a wooden "spur" on the inner side of a door; and sometimes against the wall of a chamber, perhaps as a sort of canopy over a principal seat; over a doorway it may have carried drapery as a protection from draughts. The following notices occur in *Liberate Rolls*, 31 to 53 Henry III, as given in TURNER AND PARKER, *Domestic Arch.*, 8vo., 1851; "a certain *esperum* in the circuit of the stairs in the wardrobe at Oxford" (i, 213). A *sporam* at the head of the king's chamber at Clarendon, and another *sporam* in the outer chamber of the king's wardrobe there (i, 227). A *sporum* in the queen's chamber and a glass casement in the window before that *sporum* (i, 228). Two *sporos* in the queen's high chamber (i, 230). At Havering, a *sporo* at the entry of the chapel, etc. (i, 244). At Guildford, at the head of the table in the king's hall, a certain *espurrum* of wood; and to paint there two figures (i, 253). At Clarendon, to remake anew the *espoerum* in the king's hall, at the door (i, 255). SPERVER. Also occurs, March 2, 1238, "for repairing the king's chamber, etc., and making good a fitting *spur* of boards between the chamber and chapel of the new turret, etc., £16 3s. 8d."

III. A post. In York the term is still used to designate the carved door-posts, curved at top to support projecting upper stories; TURNER, i, 91; ii, 43; iii, 30. To "sper a door" was to secure it with a SPAR or bar. 17. 19.

SPERONE; "Lapis Gabinus". At the end of II century of Rome, the sperone came in from the quarries at Gabii in the time of the Tarquins and the early part of the republic. It so much resembles the peperino that it is not always easy to distinguish them, but peperino is harder than sperone; PARKER, *Walls of Rome*, 8vo., 1874, p. iii, 2, 7.

SPERONI (It.); see ANTERIDES, or buttresses.

SPERUM; ESPERUM; see SPER.

SPERVER; Esperver, and Sparver. Old words denoting a canopy fixed over a sepulchre; or carried over the sacrament in a procession; the wooden frame at the top of a bed; some-

times the whole of a bed; also the *TESTER* or head-piece. *PUGIN*, *Specimens of Gothic Arch.* in Glossary. *HUNT*, *Exemplars*, p. 161. *ARCHÆOLOGIA*, iv, 313. The term "sperware" is used 1435 in the contract for the nave of Fotheringhay church, possibly the term "square enbattlement" may be an error of the transcriber for "sperware enbattlement"; which *DALLAWAY*, *Discourses*, 8vo., 1833, p. 174, explains as "perforated parapet". 17. 19.

SPES: *TEMPLE* TO. In the forum *Olitorium* are three temples forming one front. The one nearest the theatre of Marcellus is of the Ionic order, and is believed to be that of Hope, about to have been consecrated by Aulus Atilius Calatinus stated B.C. 254; *BRAUN*, *Ruins*, 12mo., Brauns., 1854.

SPEY (*JOHANN VON*), 1405 built the choir of the *frauenkirche* at Coblenz. 92.

SPEYER and *Speier* (*Lat.* *Civitas* or *Augusta Nemetum*; *Noviomagus*; *Engl.* *Spire*s). One of the oldest towns in Germany; under and after Charlemagne it was the residence of the emperors of Germany. The walls, which enclose a large area of land once covered with houses, have five gates; a lofty one is given in *HOPE*; and in *Illustrations*, s. v. Gate-house, 1858-9. In 1689 the town was nearly burnt and destroyed by the French; much ruined 1793; in 1815 it fell to Bavaria, since which period much has been done to improve it; and it is the see of a bishop from 1817. The cathedral dedicated to the Virgin Mary is perhaps the most stupendous structure in the Romanesque style existing, and is the largest in Germany.

474 ft. long	... nave 138 ft. long	... 105 ft. high.
450 ft.	... 120 ft. wide	... nave to top of roof 148 ft.
418 ft.	... nave 44 ft., 12 bays long.	
565 Ger. ft.		
137 metres	... 36 metres	... nave 14 metres ... 58 metres.
134 m.	... 38 m.	... transepts 55 m. north to south.
440 Eng. ft.	... 125 ft.	... 180½ ft.

It is built of the reddish stone of the country; and dates from 1027 or 1030-61; the crypt is carried under the choir and transepts; burnt 1159; upper part of the church dates after 1165; as do the two tall pointed towers with the eastern termination. It was burnt 1289, in 1450, and 31 May 1689; 1772-84 a restoration was commenced and the peculiar west end built; the hall altered and reconstructed, said to be by F. I. von Neumann; church gutted 1794. In 1823 restorations were again begun; and king Louis of Bavaria in 1845 sent F. von Gaertner to arrange for commencing a restoration, as the painting and main entrance; 1847-60 continued by L. von Klenze (*CIVIL ENGINEER*, ETC. *Journal*, 1847, x, 93; *BUILDER* *Journal*, 1855, xiii, 524): reopened 15th Nov. 1853 (*ECCLÉSIOLOGIST* *Journal*, 1854, xv, 25). During 1854-8 the west front, tower 225 ft. high, and the porch and kaiser's hall were rebuilt by H. Hübsch; *ATHENÆUM* *Journal*, Oct. 1858, p. 495. The king's choir is between the nave and transept. *MONE*, *Anzeiger für Kunde des Deut. mittel. Vorzeit* (between 1220-1524), 4to., 1832, etc. *GEIPEL*, *Dom. zu S.*, 1828. *HOPE*, *History of Arch.*, 8vo., 1840, p. 292, and plates. *GAILHABAUD*, *Monuments*, 4to., Paris, 1850, ii. *HÜBSCH*, *Alt Christ. Kirchen*, fol., 1858. *KING*, *Study Book*, 3 pl., fol., 1858, i. *LÜBKE*, *History of Art*, 8vo., New York, 1878. 14. 15. 28. 50. 96.

The chapel of S. Afra on the north side of the cathedral is of great antiquity. There are fourteen Roman Catholic churches; of the two Lutheran churches, one built 1717 has near it a relic of the *retscher* or imperial palace. A Dominican monastery. A fine town hall, the seat of the government of the circle, contains the hall of antiquities, being the Roman remains found in Rhenish Bavaria. The cavalry barracks formerly Jesuits' college. The mortuary (*Leichenhäuser*) is given in the *ALLGEMEINE BAUZEITUNG*, 1846, pl. 53.

SPHÆRISTERIUM. A very light and large space connected with the baths of the Romans, chiefly for exercising with a ball, as a *TENNIS COURT*, after the bather had been anointed. The room was exposed to the hottest sun of the declining day. *PLINY*, ii, 17, and *LUCIAN* mention it. The emperor *Vespasian* had one in his palace; *Alexander Severus* often exercised in it. *POMPEII*, 8vo., 1832, i, 181; ii 223. 1. 78.

SPHERE. A solid body contained under one single surface, and having a point in the middle called the centre, from whence all lines drawn to the surface are equal. A *SPHEROID* is a solid approaching the figure of a sphere, but not exactly round, formed by the revolution of a semi-ellipsoid about its axis.

SPHERICAL BRACKETING. Brackets or ribs brought out into such a form that the surface of the lath and plaster work which they support, forms a spherical surface. 1. 2.

SPHERICAL SQUARE. A centre-piece which occurs in a few windows of the Geometrical period of Gothic architecture in England. As in the west window of Howden church, Yorkshire, where it is formed by the inversion of the upper portion of the window-arch. Other examples are named in *SHARPE*, *Decorated Window Tracery*, 8vo., 1849, p. 79; who also notices that the "equilateral spherical triangle" was also abundantly used in composition in late Geometrical tracery, as at Dunchurch, Holy Trinity at Hull, and south transept of Chichester. Also *FREEMAN*, *Window Tracery*, 8vo., 1851, p. 28; 70; 96; 238; fig. 49.

SPHERICAL VAULTING. The same as domical vaulting. From the experiments explained in *GWILT*, *Encyc.*, taken from *RONDELET*, it is evident that these vaults, *i.e.* domes, have less thrusts than coved vaults. 1.

SPHEROIDAL BRACKETING. Bracketing which gives a surface of a spheroid when lathed and plastered; *NICHOLSON*, *Dict.*, 1857-62. 1.

SPHINX. This compound figure, a mysterious creation of fancy, takes a prominent part in the arts of ancient Egypt, Assyria, Phœnicia, Greece, and Rome, being as it is considered introduced into the western world from Asia or Ethiopia; and in modern times has been adopted by the artists of the Renaissance and modern periods as an important decorative feature. *WILKINSON*, i, 128, states that the first representation of a sphinx is not older than the XVIII dynasty; iii, 310, he gives VI and XII dynasties for it; and *BIRCH* states it was the emblem of the god *Harmachis*; its earliest appearance is IV dynasty, the great sphinx representing *Shafra* or *Khefen*; the sphinx was called *Ha* or *Akar*. The somewhat similar creations are noticed s. v. *CHIMÆRA*, *GRIFFIN*, *HARPY*, and *MONSTER*.

There were several kinds of sphinxes, types or representations of the king. *BIRCH* states that *Thothmes III* is represented as a winged sphinx on an ivory scarabæus, probably the first appearance of the sphinx as an Egyptian type; and alludes to a painting of queen *Mut-shem-t* of the XXth dynasty as a winged sphinx (*LAYARD*, ii, 460-1). They are nearly all seated or crouching; one figure 30 ins. high in a walking attitude in high relief, is now in the British museum. 1. The pure lion; as found by capt. Caviglia between the paws of the great sphinx; now in British museum. *LION*. 2. The lion with a ram's head (*crio-sphinx*) as in the avenue at Karnak; *RAM*. The mild and benignant expression of the sacred ram of Ammon may indicate peace and tranquillity. 3. The lion with a hawk's head (*hieraco-sphinx*); found at Abou-Simbel, by Belzoni. 4. The lion with a male human head (*andro-sphinx*)—the great sphinx; perhaps typical of the union of intellect with physical force. 5. The great sphinx, formerly considered to have a female human head, and said to be emblematic of the rise of the Nile—fertility and strength. One with a female head was found while excavating for the temple between its paws, by capt. Caviglia, and now in the British museum; and only one found on a monument, that of *Haremheli* or *Horus*; *SOCIETY OF BIBLICAL ARCHÆOLOGY*, *Trans.*, iii, 487, Dec. 1874. Both 4 and 5 are probably connected with the worship of *Osiris* and *Isis*. 6. The lion's body with female head, breast, and arms, as in the relief at Karnak; and on the obelisk of Monte Citorio at Rome. (*WILKINSON*, iii, 310.) 7. The variety of forms in which sphinx figures occur is very great, principally in delineations; where it was used as the sign for a king, and usually appears to preserve his features. 8. One with four heads, supposed to be unique, is in the Cabinet of Antiquities at Vienna; the Ammonian ram with four heads is shown in *Descr. d' Egypte*, fol., ii, pl. 35-6;

and in one instance with wings also. Among the Egyptians, it is said it was the symbol of religion by reason of the obscurity of its mysteries; on the same account the Romans placed one in the porch of their temples (6).

Egypt.—Nearly in a line with the south side of the second pyramid, is the great sphinx, hewn out of the solid rock, the body is 140 ft. long, the paws extend 50 ft., the height from the platform between the paws to the top of the head is 62 ft.; in the Egyptian gallery in the British museum is part of the beard, and the head and upper part of the sacred serpent or Uraeus which crowned its head; SHARPE, *Egypt. Antiq.*, 8vo., 1862, p. 1-3. MARIETTE, *Notice des Principaux Monuments à Boulag.* 8vo., Paris, 1869, p. 205-7, No. 581, refers to a tablet therein as stating that this sphinx was one of the monuments restored by Cheops, and is therefore anterior to him. Between its paws is a small temple; BIRCH, *Excavations in 1816 by captain Caviglia, in MUSEUM OF CLASSICAL ANTIQUITIES*, ii, 1, 27. KENRICK, *Ancient Egypt*, 1850, i, 133-7. Maspero is now (1886) again excavating for this temple and for preventing the refilling with sand. PRIESE D'AVENNES, *Mons. Egypt., Bas-reliefs, Peintures, etc.*, fol., 1847; and *Hist. de l'Art Egypt., d'après les Mon.*, fol., 1879. Besides this colossal sphinx, another large one was found by Belzoni near Thebes. Two colossal, from Egypt, are on quay of Wassily Ostrov at S. Petersburg (PEN. CYCL., 29a). In the Louvre at Paris is the sphinx of Ouphates; of Néphétis 398 B.C.; Hackoris 392 B.C.; and Necht-Harhévi from the Serapeion; one of these is in one block of rose-coloured granite 22 ft. long, of XIIIth dyn.; fig. 41 in PERROT AND CHAPIER, *Hist. de l'Art, Egypte*, 8vo., Paris, 1882, i; and give fig. 493 one with human hands. DE ROUGÉ, *Notice des Mon.*, etc., 12mo., Paris, 1875, p. 11-53, describes these works in the Louvre.

The sphinx was placed before every temple; an avenue of them (Gr. *dromos*) formed the usual approach to it; as at Karnak, with female heads, and another of rams' heads; leading from Luxor to Karnak the *dromos* was 6,562 ft., over a mile long, of about 1,000 (? female-headed) sphinxes having a statue of Amunoph III between the forefeet; and is 75 ft. 6 ins. wide between the pedestals, which are about 13 ft. apart (WILKINSON, ii, 94; iii, 138, states "the Egyptian sphinx was never female as that of the Greeks"); at Essaboua in Nubia, the male heads had a high cap, the sacred serpent rising erect on the forehead. At the Serapeion at Sakkara, the sphinxes were about 12 ft. apart and the avenue 50 ft. wide, the length being nearly 1,500 mètres or 5,000 ft. EDWARDS, *Up the Nile*, 8vo., 1877, i, 79, Sakkara; at Luxor, i, 208, 216; the sphinx, ii, 719. DALY, *Revue Générale*, 1860, xviii, 51. VYSE, *Operations at Gizeh*, 8vo., 1840. WILKINSON, *Ancient Egyptians*, edit. by BIRCH, 3 vols., 8vo., 1878. ILLUSTRATED LONDON NEWS, June 19, 1886.

Assyria.—A pair of crouching sphinxes, 5 ft. square, were found at the entrance to the south-west palace at Nimroud, the body was a winged lion; perhaps bases of wooden columns; LAYARD, *Nineveh*, 8vo., 1843, p. 189; 1876, p. 251 and cut. His *Nineveh and its Remains*, 8vo., 1849, gives i, 349, the same example; also ii, 214; an ivory panel i, 394; while i, 376; ii, 25, and pl. 95 of *Monuments of Nineveh*, 1st series, gives the double crouching sphinxes between two winged bulls. An ivory shows a winged sphinx.

Phœnicia.—PERROT ET CHAPIER, *Hist. de l'Art*, 8vo., Paris, 1885, iii. The towns of southern Spain, probably of remote Phœnician origin, have this type on their coins, as Asta, Iliberis, Munda, Osca, Urso.

Greece.—Also probably of Phœnician origin, was a lion's body with female head, and winged; there are specimens in the Towneley collection in the British museum. The Thebais sphinx (? harpy) is described by EURIPIDES, *Phœnissæ*, 806; and PAUSANIAS, ix, 26; who, v. 11. 2 describes the statue of Jupiter at Olympia, by Pheidias, as "on each of the forefeet there are Theban youths carried off by sphinxes". It appeared also on the throne of the Amyclean Apollo, an older work; and among the decorations of the great statue of Minerva at Athens.

Skyles, son of Ariapeithes, a Scythian king, built a large house at Olbia, a Greek city on the Dnieper, a colony of Miletus, which house was surrounded by marble sphinxes and griffins; HERODOTUS, iv, 79, relates it, and probably saw them. NEWTON, *Essays on Art*, 8vo., London, 1880, refers to the large sphinx, now in British museum (no face), taken 1858 from the Sacred Way to the temple of Apollo at Branchidae, near Miletus (and in *Hist. of Discoveries*): also to it, in SCHLIEMANN, *Mycenæ*, No. 273, and the transit through the islands in southern part of the Archipelago (LENORMANT, *Revue Arch.*, xxviii, p. 1, pl. 12; ROSS, *Reisen*, iii, 21): on a pendant, given in CESNOLA, *Cyprus*, pl. 25, same as on the high crowns of the terra-cotta figures found at Kition (p. 315): and p. 384, 391, 398, medallion sphinxes found 1831 in the tomb Koul Oba, near Kertch, similar to those at Athens, with others; and 1864 in the tomb of the supposed priestess; a drinking-cup in the form of a sphinx, described by STEPHANI as "the most beautiful representation of the Greek sphinx which he has ever seen": also to a *rhyton* in the British museum, found in a tomb at Capua; NEWTON, *Castellani Collection*, 1874, pl. xii.

Etruria.—From Vulci, several are given in CANINA, *L'Antica Etruria Marittima*, fol., Rome, 1851, pl. 110; p. 105 showing wings curled up like elephants' trunks, and one is shown in DENNIS, *Etruria*, 8vo., 1848, ii, 347; 395, found at Poggio Gajella. The bowls or *pateræ* found at Curium; Amathus; and elsewhere, on which are sphinxes, are given in CESNOLA, *Cyprus*, 8vo., London, 1877.

Asia Minor.—At Euyuk, figures like Assyrian in position, 10 to 12 ft. high, as posts to a gateway; human heads, birds' bodies, lions' claws, perhaps the sacred hiera and symbolical of regal government; CIVIL ENGINEER, etc., *Journal*, 1850, xiii, 110; HAMILTON, *Researches in A. M.*, 8vo., London, 1842, i, 382; TEXIER, *Asie Mineure*, 1839-49, i, 209. PERROT ET CHAPIER, *Hist. de l'Art*, 8vo., Paris, 1885, ii. SCHARF, *Intro. to Lycia, etc.*, 8vo., 1847, p. 14, gives an example from the acropolis at Xanthus, where the blank part of the wing was painted; and one from TASSIE, *Collection of Intaglios*, No. 422. Winged female sphinxes from gable of tomb, acropolis at Xanthus, in Brit. mus.

Roman.—A female-headed sphinx guarding a cinerary urn, at Pola; STUART, *Athens*, fol., 1816, p. 9. A carved female sphinx found at Colchester, in Essex, is preserved in the museum there; E. W. A. HAY, *Discovery—Theban Sphinxes*, 8vo., Colc., 1821. In the painted decorations of the Baths of Titus, and similar works at Pompeii and at Herculaneum, are several delineations, of which many have long curved necks.

India.—Man-sphinxes are only to be seen, as at Ellora; the fourth incarnation of Vishnu is a man-lion. It spread into Tibet and other countries where the lion itself never came; and is called *Narasinha*, man-lion, or *sinhas*, pronounced *singhas*, possibly the origin of the Gr. σφίγξ; the Greek language offers no etymology for this word, nor the Coptic (the Egyptian). In the ruins of Chandiseva, in Java, on the steps of the great temple are half-lion and half-elephant sphinxes. At Rangdn, is a supposed descendant of the great human-headed lion of Nineveh; FERGUSSON, *Indian Arch.*, 8vo., 1876, p. 623. At Arracan, is one considered to be a female. At Nikeghoon, colossal lions or sphinxes; COX, *Burmhan Empire*, 8vo., Lond., 1821, p. 105.

Africa.—Two winged female sphinxes drawing a war-chariot, are cut on the right of the keystone of a triumphal arch at Tripoli, temp. Antoninus and Aurelius Verus; while two griffins or hawk-headed sphinxes with wings are on the left side; BOWYER, *History of Egypt*, 1804.

Medieval.—At door of Teano cathedral.

LIBRARY OF ENTERTAINING KNOWLEDGE, *Egypt*, 8vo., 1832, i, 211-33. GAILHABAUD, *Monuments*, 4to., Paris, 1850, i, one plate. WINKLEMANN, *Werke*, iii, 330, etc.; corrected in the French edition of 1790. MOREAU, *L'Édipe et le Sphinx*; Symbolism; in DALY, *Revue Générale*, 1864, xxii, 118. EDINBURGH REVIEW for Oct. 1851. 6. 14.

SPHYS (FRIEDRICH); see SPEISET (F.).

SPICATUM; **OPUS**; see **HERRING-BONE WORK**. A mural decoration especially characteristic of the western provinces of France, in a great number of buildings which belong to the decline of Roman Art. At the church Savénieres at Poitiers. Two mediaeval examples are given by BATISSIER, *Elements*, 12mo., Paris, 1843; p. 432; 490; called Gallo-Roman. DUCAREL, *Anglo-Norman Antiqu.*, fol., Lond. (1767), p. 151; but see WOILLEZ, *Beauvois*, fol., Paris, 1839-49.

SPICATA TESTACEA of PLINY; the tile pavement of the streets at Siena. Bricks spicated; see **HERRING-BONE WORK**.

SPICER (WILLIAM), 1559-60, surveyor of the works at Upnor castle, Kent, with Simon Basyll as comptroller, and Richard Watte, clerk of the works and of store; British museum, Add. MS. 5752, fol. 344-360. 1584 he was appointed by lord Leicester to succeed Rowland Johnson as surveyor of the works and fortifications at Berwick; CAMDEN SOCIETY, *The Egerton Papers*, 4to., 1840, p. 101. He had a grant 1597 of the office of surveyor of the Queen's Works with the usual fees of 2s. a day, 6d. for his clerk, and 4s. for boat hire, riding, and diet when thought requisite; CALENDAR of State Papers, *Domestic Series*, p. 439, s. date. It was reported 1599 July 25, "that the fortification at Carisbrook was not finished, Spicer has paid £1664 13s., and Genebelly have long since delivered their books to Leigh, and he to auditor Gofton, by whom they must be charged and discharged." Great faults are found with the materials; CALENDAR, s. d., p. 260; the last entry in respect of him.

SPIDER. Arachnida. "Stanilhurst findeth that, anno 1095 certain Easterlings came to the north side of Dublin,—and founded Oxmorton—from thence 1098 king William Rufus had that frame which made up the roofes of Westminster Hall, where no English spider webbeth or breedeth to this day", *Builder Journal*, 1856, xiv, 33. This of course does not refer to the present roof. The same is said of the roof of the abbey and hospital called La Byloque at Gand. The fact probably being that spiders do not make their webs in such airy places in buildings.

SPIEGEL (JEAN), 1539-47, was one of the masters of the works of the city of Strasbourg. He was succeeded by M. de Zeitz. SCHNÉEGANS, *Maitres d'Œuvres*. 24.

SPIGOT AND FAUCET JOINT. Also called Male and female joint. The sinking or collar at the end of one pipe to receive the flat end of another, the space between being plugged, to make a water-tight joint. Socket and spigot joint with lugs coupled with bolts. **SOCKET**. **FLANGE JOINT**.

SPIKE (Fr. *chardon*). A sharp termination to a wood or metal rod, fixed as a fence, generally for the purpose of preventing persons from sitting on, or climbing over, a wall or parapet. Spikes 4 to 5 ins. long are in Fr. *dent de loup*. The running diamond-shaped cast-iron spiking fixed on the top of a wood fence, is described as dogs-tooth. Spear-heads as spikes to an iron railing appear to have been introduced at Versailles.

A large long iron nail with a great flat head to fasten planks or timber: as "midel spikings" in BROWNE, *York Cath.*, 4to., 1838-47; p. 170. 1532 Spiking, spykings; SURTEES SOCIETY, *Finchale Priory*, 8vo., 1837, p. 449. 4. 25.

SPILEFSKI (.....), at Warsaw; see CORAZZI (.....).

SPILLER (JOHN), "mason, of Temple lane, Blackfriars, died 17th May 1794, at Croydon, in a deep decline, brother to the famous architect; he was pupil of Mr. Bacon, and carved the statue of Charles II in the royal exchange"; GENTLEMAN'S MAGAZINE, 1794, i, 485. REDGRAVE, *Dict. of Artists*, 8vo., 1878, gives his birth as in 1763. JOHN is attached in publications to various buildings, all which were probably by his brother.

SPILLER (JAMES). At the royal academy of arts the works in wax exhibited by "J. S. Junr." in 1778-9 and 1785 are probably by John; while the following "J.'s" are probably all by James:—1780 design for a nobleman's villa; 1781-3 the additional buildings to the London hospital, Whitechapel road, after its erection 1740-60; succeeded by ... Wood; and John Robinson. 1788-90 the synagogue in Duke's place, Aldgate; PENNANT,

ARCH. PUB. SOC.

London, 4to., 1793, p. 278. 1792 (i.e., 1791-7) S. John's new church, Hackney, for 2,500 persons at a cost of £28,000; *Beauties of England and Wales* (Middlesex), iv, 265-6; the spire dates 1811. 1800 the library, repository, and theatre, of the royal institution, Albemarle street (exhibited 1801); attributed also to Thos. Webster; and 1809 to Mr. Crake. 1801 (in Guilford street), villa at Roehampton for B. Goldsmid, esq.; and design at Woodford. 1805-6 a house at Tellimore, Hertfordshire, for ... Taylor, esq. March 1807, he and T. Spencer were appointed to survey the houses in the streets north-west of Brunswick square, and published *Address to the Governors, etc., of Foundling Hospital*, 8vo., 1807; and *Reports on the Building Estates*, 8vo., 1808. 1820 the front portico to Drury lane theatre. He was surveyor to the Eagle insurance corporation, in Cornhill; wrote *A Letter to Sir J. Soane on the New Churches*, 8vo., London, 1822; and in 1809 had a legacy of £300 from Richard Gough, F.S.A. (GENT'S MAG., lxxix, 322). The date of his death has not been found. His *Observations on the Code of Instruction—Office of Works*, 1815, is in MS. in sir John Soane's museum. A younger brother Robert left a daughter, who lived with James.

SPILESBY (ROBERT), succeeded 1466 to John Porter as "magistri cementariorum" at York cathedral, "at 3s. 4d. per week that he laboured, and a yearly salary of 26s. 8d. and not to be absent without leave." He died in 1472, when the roof of the central tower was completed. He was succeeded by W. Hyndeley, then warden of the lodge of masons. SURTEES SOCIETY, *Fabric Rolls of York Cath.*, 8vo., Durham, 1859.

SPINA. The long low wall dividing the circus of the Romans, and round which the chariots ran; at each end of it was the *meta* or GOAL, as represented s. v. Two obelisks formerly belonging to the *spina* of the circus maximus, one 1589 was removed by D. Fontana to the piazza del Popolo, and the other 1588 to the front of S. Giovanni Laterano; also one 1586 from the circus Floralis, Neronis, or Vaticanus, to the front of S. Peter's church. The *spina* of the circus of Romulus (of Caracalla), son of Maxentius, A.D. 311, was about 837 ft. long, 20 ft. wide and from 2 to 5 ft. high; it was about 36 ft. nearer the east than the west side. The obelisk now in the piazza Navona, with other works of art, decorated it. 1. 25. 78.

SPINDLE. The arm passing through a rim or mortise lock and to which the knobs or handles are attached for opening the door. There are many patent varieties, each possessing some advantage.

SPINELLI (...), eighth duca di Laurino, in 1767 carried out from his own design, the staircase and oval court at his own palazzo Laurino, strada dei Tribunali, at Naples, imitating those at Caprarola; as recorded in an inscription. The façade of the palace is a good example of the style of XVI cent. 28.

SPINELLO SPINELLI (PARRI, i.e., GASPARRI), painter, son of Spinello Aretino, painter, became a pupil of L. Ghiberti at Florence. He designed the church of Sargiano, near Arezzo (?), for fra Bernardino da Siena. It has been annexed as a sacristy to the magnificent building now seen; the external walls remain and show the manner in which the church was decorated by Spinelli; VASARI, *Lives*, 8vo., London, 1850, i, 391-400; edit. Flor., 1846-9.

SPINKWELL and **CLIFF WOOD QUARRIES**. They are situated at Bradford; and are now considered to be among the best of the Yorkshire quarries. These stones have been extensively used in London and throughout the kingdom: as the town halls at Manchester 1868; and at Bradford 1870; Wakefield, 1877, etc. The crushing weight per cubic inch, as tested by sir W. Fairbairn, Manchester, is 7,647 lb., being almost equal to Aberdeen granite 7,770 lb.; Portland stone being on bed, 2,660 lb. The analysis shows:

Pure silice	...	88.5	Potash5
Alumina	...	7.5	Magnesia5
Oxide of iron	...	2.5	Loss5
					100.0
					II H

SPINNGRUEBER (MICHAEL), 1686-9 built the Franciscan monastery attached to the church at Salzburg, where he was in the service of the archbishops, and died 1694. 68.

SPINNIES. The term used in Leicestershire for large enclosures of undulating land, with occasional clumps of trees.

SPINTHARUS, of Corinth, by order of the Amphictyonic Council rebuilt the temple of Apollo at DELPHI, after the burning in Olymp. 58.1., B.C. 548; the small cupola which was wanting was added by Theodoros, the PHOCIAN. PAUSANIAS, 10, 5.5. CLINTON, *Fast. Hellen.*, ad h.c., p. 4. DALY, *Revus Gén.*, 1857, xv, 119.

SPIRA. The Roman term (Gr. *speira*) for the fold of a serpent laid at rest; the coil of cable rope; the base of a column; and the astragal or *torus*. It may also have referred to the volute (*in spiris*), as quoted s.v. BATRACHUS.

SPIRAL. A curve which makes one or more revolutions round a fixed point, and which does not return to itself. A term often applied to a winding STAIRCASE. Also to a scroll in ornament. By far the finest specimens of goldsmiths' work in this treasure are the large spirals (*helikes*) terminating in gryphons' heads (pl. XXVIII of CESNOLA, *Cyprus*), which show a vigour of design and a refinement of execution worthy of the best age of Greek toreutic art. These spirals seem too large to have been worn in the ears and may have served to ornament tresses of hair; it is, however, certain that earrings of this form were worn; NEWTON, *Essays on Art, etc.*, 8vo., 1880, p. 313. The term is used by RANDLE HOLME, *Academy of Armory*, fol., Chester, 1668; p. 187; 162-3-4; and 472; and by WHITTINGTON, *Eccles. Antiq.*, 8vo., 1811, p. 163, for like a spire or spiral shape. "Spiry" is used by WREN, *Parentalia*, fol., 1750, p. 311. VOLUTE. 1.

SPIRAL COLUMN; see SOLOMONIC ORDER. A spiral shaft was in XVI cent. introduced into furniture for legs, balusters, bars, and similar decoration.

SPIRAL FLUTING to the shaft of a column, as at the baths of Diocletian; see FLUTE, p. 62b.

SPIRAL SLOPE; see STAIRCASE. CORDONATA, or stepped plane.

SPIRAMEN; *Spiramina*. The Roman term for a shaft or vent to a tunnel, as to the *specus* of an aqueduct. These were made at intervals to prevent its bursting, in the roof; or if another channel ran above it, then in the side. When underground, a well or PUTEUS (by VITRUVIUS) was formed to the aqueduct at distances of 80 to 120 Roman feet, or 240 according to PLINY, who calls them *lumina*. *Detached Essay, Aqueduct*, p. 7.

SPIRE (Old Engl. *broach*; Hind. *kalsa*; It. *guglia*; Sp. *aguja*; Fr. *flèche*, *aiguille*, *epier*; Ger. *spitze*, *thurnspitze*). The tall pyramidal termination to a tower. It probably arose out of the pack- or saddle-roof, as at Than or Thon church, Normandy, about end of XI cent., and usually added to a campanile and to towers of an earlier period; at Caen and its neighbourhood. DUDLEY, *Naology*, 8vo., 1846, p. 547, refers to the Buddhist temples for the origin, antiquity, and import of the symbolical spire and pinnacle. It has been stated to allude to the impalement of the ancient martyrs; WALFORD, *Scientific Tourist*, 8vo., 1818. It is generally octagonal, in which case it rises partly from the walls of the tower and partly from arches called squinches formed anglewise from wall to wall, to cut off the corners, as it were, and afford a base to the angles of the spire. The wonder of these constructions is their extreme thinness and lightness.

The earliest spire in England is supposed to be the one to Oxford cathedral, about 1220; KING, *Handbook, Eastern Cathedrals*, 8vo., 1862, p. 7; 30; 31, the original summit is set up in a garden. The spire of old S. Paul's cathedral, finished 1222, was about 500 ft. or 520 ft. high (STOWE) from the ground; and 489 ft. (FERREY); Salisbury, erected 1330-75, is 180 ft. high, or 404 ft. or 393 ft. from the ground. Strassburg finished 1439, is 450 or 468 ft. English spires have been ranked thus: Salisbury, Louth, Coventry, Newark, and Grantham, with a number in Northamptonshire; that of S. James's church, Louth, is admitted by all to possess a high claim upon the attention of the architect;

it was published to a large scale by Maughan and Fowler in 1852. The foreign spires thus: Strassburg, Freiburg, S. Stephen's Vienna, Antwerp. No example of a mediæval spire is known in Ireland.

It is not often that the dates of spires can be obtained from documentary evidence; that of S. Mary Magdalene's, Sutton Ashfield, Nottinghamshire, was built soon after 1391; bishop Buckingham's *Memorandums*, fol., 379; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1874, p. 171. The spire to Louth church was erected 1500-15 (COLE); "from ground to highest stone of the broach by the king's yard 18 score feet, and great measure showed by master mason and his brethren"; ARCHÆOLOGIA, x, 85-6, with accounts. COLE MSS. states it is 140 ft. from the gutter. 1521 20 Feb. cost of SPIRE to Kertlyng church, Suffolk; CAMDEN SOCIETY, *Bury Wills*, 1850, p. 123. The spire of Sleaford church, Lincolnshire, was considered by E. J. Willson to be the earliest stone spire in England; BRITTON, *Edifices of London*. It is said that all the spires in Northamptonshire were built by the protestants; BILLINGS, in CIVIL ENGINEER, ETC., *Journal*, 1844, vii, 47. The centre spire of Lichfield cathedral dates 1661-8.

Spain and Portugal.—Octagonal of stone rare in Portugal. At Gerona, octagon tower XIV cent., spire 1750-75; STREET, 334.

Germany, etc.—At Breda, 362 ft. high. S. Michael, Hamburg, still 456 ft. high. Seven are given by BREWER, in *BUILDER Journal*, 1865, xxiii, 692-3.

France.—Dijon; MAILLARD DU CHAMBURE, *Voy. Pitt.*, i, 3. BUILDING NEWS *Journal*, 1874, p. 446 and plates. VIOLET-LE-DUC, *Dict. Rais.*, s. v. *Flèche*, and the references given in his valuable article.

The bulbous spire, so common in southern Europe, began to be general in the upper Palatinate; the religious effect of a spire is quite lost in this form; Heidelberg, p. 153; near Innsbruck 175; Local peculiarities are given 151; all in WEBB, *Cont. Ecclesiology*, 8vo., London, 1848, p. 116; 130.

Spire awry; at Chesterfield; paper by COLDWELL, read at R.I.B.A.; and *BUILDER Journal*, 1855, xiii, 40. At Gelnhausen; FREEMAN, *Historical Sketches*, 8vo., 1876; and KING, *Study Book*, 4to., 1858, i.

Open work. LEEDS, *Moller's Memorials*, 8vo., 1836, p. 136, 142, 165 heights. Esslingen, Meissen, Thann, Batalha, Burgos 1442, these are of lesser size and some of more modern date than Freiburg or Cologne; Cambrai. S. Marie Hilf at Munich, 1839; Constance; Strasburg; S. Stephen's church at Vienna, Sees, which has a number of cinquefoils on all sides.

Spire renewed. This has been effected at Louth by Thomas Egglefield, freemason and steeple-mender, in 1627-8; BRITTON, *Arch. Antiquities*, 4to., iv. Francis Goodman of Mordiford, 1793; DUNCUMB, *Herefordshire*, i, 599; J. Cheshire of Nether Whitacre, 33 ft. of S. Martin's, Birmingham, 1781; BUILDING NEWS *Journal*, 1856, Jan. 15: T. Birch, as described s. v. Scaffolding: Jos. Blackburn of Nottingham, has (1886) restored a number, including that at Grantham 300 ft. high; and Josiah Till of Nottingham.

The spire is built of various materials, and covered with lead, shingles, or slate. Brick; 1361 at Norwich; WINKLES, *Cathedrals*, Chartres, p. 69, note. Iron spire; at Vienna, R.I.B.A., Jan. 1844; and C. E. J., vii, 130-1. Others at Bordeaux; Rouen; Bruxelles; Auxerre. Zinc; NOTES AND QUERIES *Journal*, 3rd Ser., vii, 461. Timber; PRICE, *Carpentry*, 4to, 1753, p. 33, and other works on that material and of that period. ROMBERG, *Zimmerwerks Baukunst*, 4to., Leip., 1846-50, p. 111, etc. KRAFFT, *Carpenterie*, fol., 1805, pl. 67, pt. 2. At Ragatz; STREET, *Brick and Marble Arch.*, 8vo., 35; 250. At Stowmarket, about 60 ft. high, xv cent., out of the perpendicular.

No settled proportion seems to have been observed in general; sometimes the height did not exceed four times the diameter of the base; whilst at other times it was as eight to one. The thickness of stone:—"At Chartres cathedral the spire is 31½ ins. thick at bottom and 11½ ins. at top in a length of 156 ft. 8 ins.

All those in Normandy are about 7 ins. at bottom and 4 ins. at top. At Salisbury it is 9 ins. at bottom and about 7 ins. at top. The stone ribs of the octagonal spire of Freiburg cathedral are at intervals of about 15 ft. girded together by double horizontal bands of limestone, but in the middle of each of these bands an iron cramp is inserted in such a manner that one-half of the thickness of the metal is fixed in the under course of the stone work, and the other half in the upper course, by which means all thrusting or bulging out is prevented. The space between the ribs and bands is filled up with perforated tracery, etc."; MOLLER, *Memorials*, trans. by LEEDS, 8vo., London, 1836, p. 150. A discussion as to horizontal or right angle for the courses in construction; *BUILDING NEWS Journal*, 1876, xxxi, *passim*. 1.

Entasis at Newark; and on distinct lines; CIVIL ENGINEER, etc., *Journal*, 1844, vii, 47. At Gedling church, near Nottingham, 1320; ROBINSON, in *idem*, p. 105, with cut. A mathematical method of setting out this entasis by T. Turner of Hampstead, is given in *BUILDER Journal* for 1848. The ordinates may be obtained very nearly true by taking a thin lath and bending it to the extent required. A rule for calculating the *taper* of a spire was given about the same time. S. Jean at Auxerre; and S. Foy at Schelestadt, both of XII cent., are given in *MOYEN AGE MONUMENTAL*, fol., pl. 24, or i, pl. 10; and pl. 239 or i, pl. 21. 1.

PENNY CYCLOPEDIA, 1842, s. v. Spire, gives a list of the heights of tower and of spire of thirty-five buildings, with some proportions. CLAYTON, *Towers, etc.*, of Sir C. Wren, read 5 and 26 Apr. 1852; and in CIVIL ENGINEER, etc., *Journal*, p. 169, also gives a list. WICKES, *Towers, etc.*, of Mediæval Churches, fol., 1858-9. TROLLOPE, *Church Spires*, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1875, p. 61. DENISON, *Church Building*, 2nd edit., 8vo., 1856, p. 56; 3rd edit., 1880; and *BUILDER Journal*, 1865, p. 33, etc. PARKER, at the Royal Inst. of Brit. Architects, *Sessional Papers*, *Abbey Church of Cane*, 26 Jan. 1863. TAYLOR, *Tower, Steeples, and Spires of Sir C. Wren*, 8vo., 1881. 1. 14. 17. 19.

BROACH; SADDLE BACK or pack saddle; COURONNE; SCAFFOLD; SHAFT. The beautiful CROWN SPIRE of Scotland. STEEPLE. TOWER. VANE. DRAWING; the two published by MOLLER.

SPIRE CROSS. During the mediæval period, every church spire was surmounted by a cross, proceeding from a globe, and frequently finished by a cock. The richest examples are found in France and Germany. One of iron, like that of Amiens, is given from a sketch by A. W. Pugin, in LEE, *Glossary*, 4to., 1876, p. 379.

Lancea, virga, and flèche, are terms used to a kind of pillar probably to surmount the cross at Northampton; WILLIS, *Nomenclature*, 4to., Cambr., 1844, p. 41.

SPIRE LIGHT. A window in a spire; they are very frequent during the Decorated period, as in the broaches of Northamptonshire; they are frequent in Early English, and occasionally in the Perpendicular; RICKMAN, 5th edit., 1848, p. 154. FREEMAN, *Window Tracery*, 8vo., 1851, p. 258. Curious Early English examples at Oxford cathedral; KING, *Eastern Cath.*, 8vo., 1862, p. 32. ASHWORTH, *On the Origin of Spire lights*, as symbolical of the pharos; read at EXETER ARCHITECTURAL SOCIETY, given in *BUILDING NEWS Journal*, 1870, xviii, 468.

SPIRELET (It. *cuspid*; *pergamena*; Fr. *flèche*); spiret, spiracle. The tall light spire over the chancel of a cathedral; as at Amiens, Beauvais, Notre Dame de Paris; Cologne; etc.

SPIRES; properly SPEYER, in Germany.

SPITAL; spittel; spytzel (Ger. *krakenhaus*). A corruption of hospital; an almshouse for the aged and infirm. The *heiligen geist spital* at LUBECK was founded 1312 for 80 poor people. To the north of Lincoln is a village called Spital, having a hospital; and a parish in London is Spitalfields. HORRY, *Studien über Kranken Anstalten doren bauliche Anlage und Ausföhrung*, 4to., Vienna, 1866; and *Die Neue Kranken—in Wien*, fol., 1866. 19.

SPLANDRELLYS; see SPANDREL.

SPLASHING; see FLASHING.

SPLAY (Fr. *biseau* in VIOLETT-LE-DUC; *entre coupe*; Old Fr. *displayer*, to spread out). 13 Henry VII., "plastering the ... splayes of windowes", etc.; Accounts of Little Saxham. The heading joists of a boarded floor are often splayed in their thickness. A CHAMFER is a narrow splay cut off the angle of an arris. A splay or bevel may be any angle, but generally for work sloped for widening an opening. *Flanning* is a local term for an internal splay; *fluing* is another. A bevel is a sloped or canted surface like a splay. 1. 17. 19.

SPLINE. A small poling board. Fastening up a framework of splines before a window for protecting it, was called SHINGLING. It is a narrow and thin length of wood such as are used at present 1886 for the seats and backs of garden benches.

SPLINTER. A very small piece of wood split or chipped off a larger one.

SPLIT BAR; see BAR; DOOR.

SPLIT PIN. A pin, round or flat, having a head at one end, and a split at the other, through which a cottar, cotterall, or cottrell passes to act as a KEY in wedging.

SPLIT TIMBER (Fr. *planchette*; *dedoubler*). Timber that is split by rending is naturally stronger than when sawn, as the fibres, in oak especially, are so tortuous as often to be cut through. Split oak is used for staves for barrels and for fencing. Roofing slates are said to be split into thicknesses. SLIT DEAL.

SPOERER (CHRISTOPH), 1678 was baumeister to the cathedral and city of Wurzburg. 68.

SPOIL BANK. In making a line of railway, or in road making, which involves cuttings and embankments, it is endeavoured to so adjust the surface of the way as that the cuttings and embankments shall be equal; that is, that the materials from the one shall just suffice to form the other. An excess of stuff requires space to contain it, hence the formation of a spoil-bank.

SPOKE SHAVE. A sort of plane, consisting of a blade set in a long frame and worked towards the person by two hands for smoothing large work. The DRAWING KNIFE is larger and has the handles turned towards the person.

SPOLETO and Spoleto (Anc. *Spoletum*). A town in the province of Umbria, situated on the river Tessino. It was nearly destroyed 1155 by Barbarossa. The strong castle was built by Theodorice, repaired by Narses, rebuilt by card. Albornoz, enlarged by B. Gambarelli, il Rossellini, for pope Nicholas V (1447-55), and now as a prison. There are fragments of Roman work; also a bridge long covered up but again covered; the porta Fuga; another arch with some foundations; and other remains in the upper part of the town. SERLIO, *Architettura*, fol., Venice, 1663, p. 212, gives a Doric gateway; and 321 a door with curious dressings. The temple to Jupiter Clitumnus near the city is noted s. v. Foligno. The aqueduct "della Torre" is not attributed to an earlier age than that of Theodorice, who died A.D. 526. It serves both as an aqueduct and a bridge over the torrent Morazia, and forms a range of ten pointed arches, each 66 ft. 11 ins. span, on piers 10 ft. wide by 40 ft. thick. CALINDRI, *Statistico Storico*, 4to., 1829, and CAMPELLO, state it was built in 604 by Theodolapins III, duke of Spoleto. CALINDRI gives the height as 263 ft., the length 676 ft.; other accounts state 308 ft. and 420 ft.; with 761 ft. and 800 ft. Thirty smaller arches rising 80 ft. according to the highest statement, upon which the channel is placed; *Detached Essay*, Aqueduct, pl. 111, fig. 13. It bears evidence of repairs and additions made long subsequent to the Lombard times, whence its substructions and the body of its nine piers are perhaps all that can safely be regarded as belonging to the original structure. WOODS, *Letters*, 4to., 1828, p. 102, state that the aqueduct was built by a cardinal in XV cent. (query Albornoz above mentioned). Something appears to have been done 1828-39 for pope Leo XII by the engineers Gir. Scaccia and C. Polchi, with Savno Natali (the bridge 1825) and Gui. Riccardi of Terni.

Since 1827 the town has been the see of an archbishop uniting Spoleto, Bevagna, and Trevi. The Gothic cathedral is dedicated to Sta. Maria Assunta. The external porch of five arcades and pulpits is by LAZZARI; *Illustrations*, Loggia, 1848-9, pl. 9; and in CALLIAT, *Encyc. d'Arch.*, 4to., v, 2 pl. The font may also be by Lazzari; LECLÈRE, *Recueil*, fol., Paris, 1826, pl. 1. A circular window is given s. v. WINDOW, *Illustrations*, pl. 249. A baptistery (renaissance) to the west is square and octagonal above. P. FONTANA, *Descr. della Chiesa Met. di S.*, 1848. GRUNER, *Fresco Decorations*, fol., London, 1844, pl. 54, gives the decorations of the Erolì chapel by Jacobo Siciliano, i.e., Giacomo Laureti of Sicily. The church of S. Agostino del Crocifisso, before Constantine (former temple to Concord); in HUBSCH, *Alt Christ. Denkm.*, fol., 1858, pl. 6. S. Andrea on site of temple to Jupiter; S. Giuliano, temple to Mars; S. Nicolo, a fine Gothic edifice, now (1848) haystore for cavalry; S. Lorenzo, small romanesque with open roof; S. Domenico, no niles, Gothic but modernised; S. Agata with a west loggia; S. Giovanni, Gothic with a rich doorway of XVI cent.; S. Gregorio, modernised XVI cent., crypt perhaps *cir.* 804 (said to resemble that in the duomo at Nepi, *cir.* 1180); plan of interior of church in LECLÈRE, pl. 52; S. Stefano rebuilt 1793; and S. Pietro, a collegiate church outside the walls, XII cent. having a profusely carved façade, much like that of S. Miniato at Florence; GALLY KNIGHT, *Eccles. Antig.*, fol., 1844, ii, pl. 9. The town house, and the Ancajani palace, which is perhaps the large palace near the cathedral covered with designs in sgraffito attributed to Julio Romano (Pippi). B. di CAMPELLO, *Delle historie di S.*, 4to., 1672. WEBB, *Cont. Ecclesiology*, 8vo., London, 1848, p. 462-6. *Illustrations*, s. v. Brickwork. 14. 25. 28. 50. 96.

SPOLIARIUM. At each end of the ellipse of a Roman amphitheatre were arches for the entrance into the arena of the combatants; and through those openings the dead bodies were dragged out into the *spoliarium*. Behind the ruins, near the Coliseum, now considered to be the *vivarium*, or place in which the wild beasts were kept before they were turned into the arena, are subterranean caverns cut out of the tufa, and supposed to have been the *spoliarium*. 28.

SPOLIATORIUM. A place for the clothes of the bathers. In a complete establishment this chamber was placed at the entrance to it. It is supposed that the frigidarium or tepidarium was frequently fitted with closets for the clothes, and these also served as the apodyterium by the Greeks, or spoliatorium by the Romans.

SPONTANEOUS COMBUSTION. The power of ignition inherent in animal and vegetable substances. Oil has a peculiar facility for developing heat. If hemp, wool, paper, sawdust, rags, soot, shavings, etc., be smeared with oil and left to the free action of the sun and air, they will soon get hot, begin to smoke, and finally burst into flame, which may account for many of the mysterious fires of mills and manufactories; *ALL THE YEAR ROUND Journal*, 1863, p. 264. Also when hemp, flax, or cotton, more or less oiled or greased, are heaped up; lamp-black, light kind of charcoal, cotton, flax; waste oiled cotton from machinery; guano, waste oily paper at printing offices; quicklime wetted; bituminous coal; hay when stacked too green; a certain kind of wax matches; iron pyrites; wood acted upon by excessively heated air; and iron reduced to small grains or powder and having remained under water for a considerable time. G. GURNEY found "that when the temperature of hot-water pipes was sufficient to burn sawdust, an invisible and inflammable elastic fluid escaped"; *CIVIL ENGINEER, ETC., Journal*, 1842, v, 28. **FLAMMABILITY. MANGANESE. OIL. OXIDATION. HEAT. IN-MAN, Sp. Comb.; Philips Fire Annihilator, 12mo., 1855. PAPERWORTH, *Notes on Sp. Comb.*, 12mo., 1855; and with App. by HINE, 12mo., New York, 1869. *Report of SELECT COMMITTEE ON FIRE PROTECTION*, Playfair's evidence, 16 May 1867, p. 170, etc.; 198. *BUILDER Journal*, 1861, xix, 485.**

SPONLEE or Spoundlee (JOHN DE), was 1350 appointed master of the stone hewers to press men for the king's works

at S. George's chapel, Windsor; Pat. 24 Edward III, p. 1, m. 21. BRITTON, *Windsor*, in *Arch. Antig.*, 4to., 1812, iii, 30. TIGHE AND DAVIS, 8vo., Lond., 1858, i.

SPOREMAN (JAN), designed 1575 the renaissance building adjoining the town-hall at Ypres; a sketch in *BRITISH ARCHITECT Journal*, 1884, xxii, p. 31.

SPOT (WALTERUS DE), was 1425 magister fabrice castri de Edinburgh. *BANNATYNE CLUB, Accounts of Great Chamberlain*, 4to., Edinb., 1817-45, iii, 154. ROBERTSON, in *Transactions of Arch. Inst. of Scotland*, 1851, i, 59.

SPOUT (Scotch rhone or roan). GARGOYLE. LION'S HEAD. **WATER-SPOUT. RAIN-WATER PIPE.** "With an small spout in ilk chalmere to convey the urine throck the wall, and with gallean heidis convenient for the wark, as salbe fund necessar used expedient, 1616"; *SPALDING CLUB, Aberdeen Burgh Records*, 4to., 1845, ii, 341. "Spout-irons", and "spout-clips" for holding the spout firmly, are patented at Wolverhampton and Darlaston; 1886.

SPREADER. It is the coarser glass formerly used in cottage windows. It is very well adapted for colour in painted glass.

SPREAD GLASS; also called BROAD GLASS. Glass blown in cylinders as sheet glass but slightly conical in form; its manufacture is now abandoned; *BATEMAN, Laws of Eccise*, 8vo., London, 1843.

SPRENGER (PAUL), of Vienna, designed before 1836 the mint in the Landstrasse; 1838-46 the Gothic façade to the rathhaus in the Altstadt, at Prag; and published *Die Baukunst des Christlichen Mittelalters*. He was professor in the royal academy of fine arts, and imperial building court councillor at Vienna; and hon. and corr. member of the royal inst. of British architects. He died 1855-6. 68.

SPRING NAIL. It is named *temp.* Edward IV; British museum, Harl. MS. 4780, p. 23. A small flat nail of various sizes usually having the head returned on one side, which gives a double thickness for receiving the blow of the hammer and clenching the wood. There is also a short square nail with a square head, the top being raised to a point or diamond-shaped.

SPRING; see RESILIENCE.

SPRING. A long piece of steel wire, or plate of steel, which when rolled up acts as a spring, as in watches, or in machinery of a stronger character. A piece of bent steel having one end longer than the other like a cottar, fixed round a pin, by which the latch of a lock is kept forward. A "Scotch spring" is applied to the best sort of locks. The spiral or helical tube of rolled wire to pull back the bell cranks of a bell after it has been pulled. The American Premium door and gate spring; British patent No. 3808 in 1876; the only spirally twisted door-spring made either to open or close a door; the only one suspended on pivots.

The usual black iron rod spring as fixed on door frame and sliding along the middle or lock style of a door to cause it to shut; made also of brass.

SPRING BEVEL OF A RAIL. The angle made by the top of the plank, with a vertical plane touching the ends of the rail piece, which terminates the concave side, of a handrail. 1.

SPRINGED or SPRUNG. In boarding a roof; the setting the boards together with bevel joints, to keep out the rain. 1.

SPRINGER (PAUL); see SPRENGER (P.).

SPRINGER (Fr. rein). The springing course of an arch. The block at the foot of an arch on each side, generally placed on a platband or impost; the top surface of the springer, or that from which the arch is raised is the "skewback"; it is generally formed radiating to the nearest centre of curvature, and this radiation is called by old writers the "sommerring" (Fr. *cousinet*; *somnier*). The springing stone of a vault which contains the lower end of the ribs. In the early stage of rib-vaulting the ribs consist of independent and separate voussours down to the level course from which they spring, (Fr. *naissance d'une voûte*). This was soon given up for a more artificial construction, where the lower courses of the ribs down to the horizontal springing are

bonded with the masonry of the wall (*Fr. tas de charge*), the ribs starting from these lower courses; WILLIS, *Vaults of the Middle Ages*, 4to., 1842; and GWILT, *Encyc.*, edits. 1867, and 1876, § 2002 *d, e, f*. The spire of King's College chapel, Old Aberdeen, is given in *BRITISH ARCHITECT Journal*, 23 April, 1886.

1. 17. 19.

The bottom stone of the raking coping of a gable. That to the north transept of S. Alban's cathedral is given in BUCKLER, *S. Alban's*, 8vo., 1847, p. 130. It has also been called summer or SOMER stone; kneeler; spur (LOUDON, *Villa, etc., Arch.*, 8vo., 1842, § 1075); SKEW BACK; and SPER. The term "springer" is applied to a corbel, by COCKERELL, *William of Wykeham*, p. 19, 45. Examples are given of German work, in HOFFSTADT, *Principes du Style Gothique*, fol., Paris, 1851, pl. 8, and p. 124. APOHYGE.

1.

SPRINGFIELD STONE. A quarry situated on the north-west side of Leeds, in Yorkshire, which supplies a rag, 6 to 9 ins. thick; block stone for common walls, from 5 to 10 ins. thick; and the laminated or flag bed, which is slaty, but more compact, from 1½ to 4 ins. thick. In an adjoining quarry is a bed of large landings extending nearly 70 ft. and 20 ft. thick; the beds are very distinct and vary from 6 to 14 ins. thick. CHANTRELL, *Yorkshire Stone Quarry*, read at Inst. of Brit. Architects and printed in *CIVIL ENGINEER, ETC., Journal*, 1838, i, 72.

SPRING HINGE. An invention to cause a door when open, to close of itself. *Redmund's* "double-acting rising spring hinge" 1855 is made as rising butts with a pillar enclosing a compound helical coil. *Gerish's* "single and double-action spring hinge" or spring butts, have a helical coil-spring placed at right angles to the hinge, sunk in the door or jamb; *CIVIL ENGINEER, ETC., Journal*, 1838, i, 156. *Arbenz*, "conqueror" spring hinge, 1878, easily regulated to any degree of strength.

SPRING CENTRE-HINGE. An invention much more slightly than the usual springs and are used to "swing doors" to close of themselves. The horseshoe centres have an advantage over the spring butts in this, that from an arrangement of the levers they can be made generally to stand open when carried out to or beyond the right angle. There are many inventions and patents. *Morris* had a coiled spring within a box round which were coiled two chains working on a quadrant. *Smith's* patent adjustable for ordinary or large doors, to the box was attached a lever, and to the pillar of the spring another. The "*ne plus ultra*" continued the principle, but the levers are below instead of above the spring. *Turner's* centres (patent adjustable regulating double-action door-spring and centre) used at the British museum; the spring is of 6 ft. or 7 ft. in length when expanded, and to the old arrangement is added a ratchet-wheel enabling the fixer to modify the strength of the spring.

The second class have levers connected with the centre by wheels and an eccentric, and upon these levers racks are cut, the notches of which form recipes for the ends of springs of which several are used in each spring. These again divide themselves into two classes, as the spring is opened or closed in opening the door. *Hart's* and *Smith's* expand a horseshoe spring. *Gibson's* closes the spring which has returned ends. A third class use the longitudinal pressure of a coil of helical spring. In *Redmund's* are two springs, one for each direction of swing. In *Greenway's* climax centres there are eight springs parallel with the door, all expanding on opening the door. *RICKMAN, Hinges in Common Use*, BUILDER *Journal*, 1859, xvii, 859. 1850 Beattie, improved door-spring; the motive power being the pressure of the atmosphere acting on one side of a piston, the other side being a vacuum; *ARCHITECT Journal*, 1850, ii, 401; *PRACTICAL MECHANIC Journal*, i, 255; *CIVIL ENGINEER, ETC., Journal*, xiii, 175, 295. 1885 *Norton*, silent door-spring fixed at the head of the door; this is used with the usual butts; and an arrangement under the floor for swing doors.

An upper "centre or pivot" is required to a swing door. The projecting pivot is usually let into the head of the doorcase, with a lever at back and screw to drive it up or down. These

ARCH. PUB. SOC.

pivots, at first round, wear into an oval form, and the door as it drops creaks against the frame. The door gets fixed in its position sometimes. Fry's centres have only a socket in the doorcase and the centre forms a flush-bolt with a slit and screw in the back of the door fixing it in its place.

SPRINGING COURSE. The impost or point at which an arch unites with its support.

SPRINKLER. A contrivance used for last two years in America, and 1885 introduced into England, called "Grinnell Sensitive Automatic sprinkler or fire extinguisher, and fire alarm", for putting out a fire which may occur in a floor of a warehouse or other room. It consists of tap-like valves which are attached to water-pipes running along the ceiling; when a fire occurs the solder of the extinguisher is melted and the water escapes in a continuous spray and an alarm is struck. It has led to the lowering of the rate of Insurance on buildings where fixed. A "thermometric fire-telegraph" was patented ... by J. G. Ulrich, who made a large one for Blenheim palace. W. Hood, of Reading, advertised 1861 a "hollow girder" pierced with numerous holes through which a continuous flow of water passed over the room, supplied by a hose from the outside; objections are recorded *s. v. HOLLOW GIRDER*.

SPROCKET. In 1736 a cove cornice is described as commonly lathed and plastered upon compass, sprockets, or brackets.

4.

SPROTBOROUGH STONE. A limestone; see DONCASTER. **SPROULE** (...), 1780 was practising in Dublin, where he built several houses for the nobility and gentry; PASQUIN, *Artists of Ireland*, 8vo., n. d., p. 22.

SPRUCE FIR (ABIES); *i.e.*, "fir from Prussia", 1679, in EVELYN, *Sylva*, 1776, p. 102. 1510 at a pageant, dancers "were appareled after the fashion of Prusia or Spruce"; *HALL, Chronicle*, p. 513-4. *Cir.* 1524 "a sprowse (cypress or spruce fir?) chest"; *NICHOLS, Illustrations, etc., of England*, 4to., London, 1797, p. 122. *DEAL*. "The land of Spruce" 1612-3; *NICHOLS, Progresses of James I*, 4to., 1828, ii, 574. "Floor of spruce deals" at Whitehall chapel, 1633; *CUNNINGHAM, Handbook to London*, 8vo., 1850, p. 551. The spruce fir-tree, the *Abies excelsa* of Norway, yields a resinous fluid which constitutes the foundation for pitch. The timber sent with its bark on, is white, straight, and even in grain, tough, light, and elastic, and more difficult to work than pine owing to the small knots in it. When cut into deals it is liable to warp unless carefully weighted in the stacks or piles during seasoning. The shrinkage is inconsiderable; the sap varies from ½ inch to 2 or 3 ins. It is unsuited for best finished carpentry or joiner's work, but for framing and coarse descriptions it may be used with advantage. The poles make ladders and scaffold poles. The planks are 3 ins. by 9 ins. and from 12 to 21 ft. long. The first quality are perfectly clean, sound, and free from knots, sap, and defects. Second quality, sound and tolerably clear, but with some having a few knots and some sap. Third quality, all faulty, and a coarser description of deals, some very rough; *LASLETT, Timber and Timber Trees*, 8vo., 1875. *ARCHER, Popular Econ. Botany*, 8vo., 1843, p. 327; 333. *BAILEY, On Fir-Timber and Deals*, read at Roy. Inst. of Brit. Architects, 20 Nov. 1843; and in *CIVIL ENGINEER, ETC., Journal*, vi, 405; 407-8. The American *white-deals* are derived from the HEMLOCK SPRUCE FIR; white spruce is only sent from Canada; all others are known as Canada, S. John's, etc., spruce. *SILLOWAY, Modern Carpentry*, 8vo., Boston, U.S.A., 1858; and *BUILDING NEWS Journal*, 1858, iv, 1245.

SPRUCE OCHRE; Brown ochre, or Ocre de Rue; also iron brown, brun de Mars, and Prussian brown. A warm but dull-coloured or brown yellow ochre. Calcined Prussian blue, or an iron oxide with alumina; but French Prussian blue as containing more alumina than the English is best. It is of great transparency, of an harmonious tone, and dries well; is as good in water as in oil; with burnt sienna it produces fine glazes, and undergoes no change.

9. 23.

SPRUENGLI (NICHOLAS), born 1725 at Berne; studied eight years under Blondel at Paris; accompanied Servandoni on his travels; and made designs for palaces for the courts of Dresden and Berlin, as well as for the empress Catherine II of Russia. He was appointed *landbaumeister* at Berne; designed the *hôtel de musique*; the *hauptwache*; and the library at Zurich. 68.

SPRUNG; see SPRINGED. BOARDING.

SPRY (JOANNES DE), lapicida, inceptor hujus chori, obiit anno 1420; an inscription on the last pillar on the right of the choir 1404-31, vaulting about 1500, of the church of S. Castor at Coblenz; WHEWELL, *Arch. Notes*, 8vo., London, 1842, p. 180.

SPUDD AND RING. An iron ring having a bottom out of which is a small projection or pin, and fitted on to the bottom of a door-frame of damp basements or outside work. The pin fits into a stone cill. It is used in Ireland. 1.

SPUR; see COUNTERFORT (Fr. *éperon*): also SPER or Canopy; and SPRINGER, or somer stone.

SPY DELF (Dut. *spuy*). A dipping-place. A drain or sewer; but the "delf" was a public watercourse not having drains into it.

SPYING PIPE or HOLE; see SQUINT.

SPYLLESBY (ROBERT); see SPILLESBY (R.).

SQUARCINE (JACOPO), or di Scorcione, rebuilt 1270 with maestro BUONO of Florence, the church of S. Salvatore at Pistoia, of which the west front (Pointed translation of Pisan romanesque) is partly altered; WEBB, *Cont. Eccles.*, 8vo., London, 1848, p. 388, gives the inscription. 28.

SQUARCINO (BERNARDO), proto-actual of the cathedral at Padua; was skilful in mechanical arrangements, and so undertook difficult restorations. In 1754-6 he underpinned the dome of the cathedral, putting four new piers with arches, so that its weight rests on these without loading the vaulting or pilasters. He was alive in 1765. The work is also said to be due to the designs of G. Gloria, "from the idea of Squarcino"; LALANDE, *Voy. en Italie*, 12mo., 1769, viii, 252-3. 3. 68.

SQUARE. Having four corners. Two sides standing perpendicular to each other.

SQUARE (Lat. *norma*, hence "normal angle" for a right angle). Squyr, skyer, reulor, as in SURTEES SOCIETY, *Fabric Roll, York Minster*, 8vo., Durham, 1859, p. 354. An instrument for trying whether an angle be a right angle or not. There are several varieties according to the trade or purpose; as brick-layer, glazier, joiner, and mason. The joiner's square is formed of the handle and tongue, giving the outer and inner squares, as explained in MOXON, *Joinery*, 4to., London, 1701, p. 5. The square is seen on the brass 1220-63 of H. Libergier, in Rheims cathedral: and 1454 in the hand of Hans Buchsbaum in Vienna cathedral. At Philadelphia in 1862 was submitted a patent universal square, which combined the try-square, the mitre, the T-square, the centre-square for finding the centre of a circle, and the graduated rule. A square for finding the centre, in PRACTICAL MECHANIC'S JOURNAL, Ser. I, i, 69. 'Ames' universal square was brought out in 1871. MITRE SQUARE; SET SQUARE; CALIPER SQUARE. BEVIL. T-SQUARE. RECTANGLE. PARALLELOGRAM. 4. 16. 19.

SQUARE (It. *piazza*, *cuidad*; Sp. *plaza*; Fr. *place*; Ger. *platz*). An English word for a space of land in which is an enclosed garden, surrounded by a public roadway giving access to the houses on each side of it. The London squares are described in BUILDER JOURNAL, xiii, 349, 400: the new ones in BUILDING NEWS JOURNAL, 1858, p. 470, etc. In Edinburgh, it is called a "scale-stair"; where also, a court is often called a square. CARR, *Caledon. Sketches*, 4to., London, 1809, p. 55. QUADRANGLE. PIAZZA. PLACE.

SQUARE. The fillet or list in a series of moldings.

SQUARE IN PROPORTION. The square was selected for dividing lands (PLINY, 18, c. 34, of the lines and limits that divide and bound fields) in the earliest times, and as a form for buildings in very early periods. It was first used for dividing lands, hence the name "Geometry"; the latter, however, originated with the

earliest state of society, some thousand years prior to the time fixed by HERODOTUS (book 2, c. 109), and it has taken thousands of years to bring it to the present state of perfection. The city of Babylon was an exact square, divided into 676 squares. Around these squares stood the houses fronting the streets, and the empty space within served for gardens. The new palace took about nine squares, and the hanging-gardens contained a square of 400 ft. on each side. Sethos, a priest, deprived the military of Egypt of their "arura" or fields of 50 feet square. The forty-eight cities with their suburbs for the Levites were commanded to be 2,000 cubits square (*Numbers*, xxxvi, 5). The Egyptian, Mexican, Babylonian, and Indian pyramids were squares, and the four sides faced the four cardinal points.

The use of the square in design during the mediæval period was proved in the publication 1858 of the *Album* of Wilars de Honecourt, an architect of the XII cent. The disputes on the question of proportioning the cathedral at Milan 1387-92 by the foreign system of squares or by the native system of triangles, was noticed by J. W. Papworth in 1854, gathered from GIULINI, *Memorie di Milano*, 4to., Milan, 1776, ii, 448-60 of the *Continuazione*, extracted from the records of the Board of Works. CESARE CESARIO, the first translator of VITRUVIUS, fol., Como, 1521, describes two principles, one on the arrangement of the square or of the octagon which proceeds from it, as referred to by C. R. Cockerell in his Lectures at the royal academy in 1846 (BUILDER JOURNAL, iv, 38). On this law of the square is founded the work by M. RORICZER, *On the Ordination of Pinnacles*, 1486, as noted s.v. PROPORTION, p. 182a, and following pars. BILLINGS notices the use of the square in Norman work; and in *Arch. Antiq. of the County of Durham*, 4to., 1846, gives two tables proving a groundwork of squares, and thus the designer would only have to communicate a rough diagram of his plan, bounded by series of equal squares, and give the dimensions of one, to be properly understood by a practical man. Also the researches of W. P. GRIFFITH 1843-52; of W. WHITE, who in 1853 considered that each architectural period had its own appropriate order of rules, the square in the Norman period, for the general proportions. Further details are also given in GWILT'S *Encyclopædia*, 8vo., 1867; and 1876, p. 963-78. MORRIS, *Lectures—Harmonick and Arithmetical Proportions*, 8vo., 1734; and LAING, *Hints for Duellings*, 4to., 1800, p. vi; show a later modern use of the square in designing.

The use of "squared" (also called "sectional" in the Paper trade) paper by Bramante LAZZARI is shown in photographed sketches in GEYMÜLLER, *Projets primitifs pour la Basilique de S. Pierre de Rome*, fol. and 4to., Paris, 1875-80; and perhaps its supplement, DURAND-CLAYE, *Stabilité de la Coupole projetée par Bramante*, 4to., Paris, 1879.

In planning a house, the Persian architect uses squared paper, the divisions representing the ordinary thickness of the walls, so that, if he does not care to spend much trouble about a plan, he has merely to draw his brush roughly through these squares and the workman knows just what is wanted. This method gives a sort of rhythmical proportion to all the rooms, and assists in continuing the rectangular system of planning, which has so especially characterised Eastern Art from Egypt and Assyria downwards; LEWIS, *PERSIAN ARCHITECTURE*, read at Roy. Inst. of Brit. Architects, *Sessional Papers*, 1881-2, p. 166.

SQUARE END TO CHANCEL. This peculiar formation to the east end of a chancel is said to be a tradition of the ancient British church; SCOTT, *Lectures*, 8vo., 1878, ii, 18. It may almost be said that there are no square-ended churches except in Great Britain and Ireland; it goes back to the oratories of Ireland, and the supposed British church at Perranzabuloe; and existed before the overthrow of British Christianity by the Saxons. The Normans introduced the apsidal end; but by the XIII cent. the triumph of the square end was complete, the French taste of king Henry III at Westminster abbey was a single exception; G. G. SCOTT, jun., *Modern Village Churches*, at Lincoln; ASSOCIATED SOCIETIES, *Reports and Papers*, 1873, p. 69.

SQUARE FRAMED. All the angles of the styles, rails, and muntins, of a framing, square, i.e., the panels without mouldings.

SQUARE-HEADED WINDOW. This form may be traced up to the very first days of tracery. The churches of Northamptonshire are singularly rich in such examples; FREEMAN, *Window Tracery*, 8vo., 1851, p. 243-53, with cuts. PALEY, *Gothic Arch.*, 12mo., 1846, p. 179.

SQUARE MAN. A carpenter; a term used in Dumfries; JAMIESON, *Dict.*

SQUARE MEASURE. 144 inches = 1 sq. foot; 9 sq. feet = 1 sq. yard; 100 feet = 1 sq. of flooring, slating, roofing, etc.; 272½ feet = 1 rod; 40 rods or perches = 1 rood; 4 roods = 1 acre; 640 acres = 1 sq. mile; 30 acres = 1 yard of land; 100 acres = 1 hide of land; but see YARD and HIDE. A square mètre = 10,764 Engl. ft. A yard square is the allowance for four soldiers drawn up in close order: eight or nine men may however stand in a yard square.

SQUARE NAIL. It is of the same shape as a "sharp nail", and most useful for oak, for other hard wood, and for nailing up wall-fruit, as the point is stronger than that of a "sharp nail" and does not turn back so easily. 4.

SQUARE OF GLASS; see PANE. Of lead, see LEADWORK. Squared pavement, see PAVEMENT. Square timber, see TIMBER.

SQUARE SHOOT; see Water-shoot.

SQUARE STAFF; see ANGLE STAFF.

SQUARING A HANDRAIL. The method of cutting a plank to the form of a rail for a staircase, so that all the vertical sections may be right angles. NICHOLSON, *Arch. Dict.* 1.

SQUARING A PIECE OF STUFF. The act of trying it by the square to make the angles right angles. 1.

SQUILLERIE; SQUILERIE (Old Fr. *escuillerie*). "The office for the platters"; LAW, *Hampton Court*, 4to., 1885, p. 151. "To the squillerie; coals, herbs, and pewter vessels", were supplied, 1551-2; CAMDEN SOCIETY, *Miscell.*, 4to., 1853, ii, p. 23. SCOURING HOUSE. SCULLERY. 17. 19.

SQUINCH (Fr. *pendentive*; *trompe*; supposed from Fr. *coinçon*, a corner cupboard). An arch or arches corbelled over (i.e., squinched), formed at the inside angles of a square building, to carry an octagonal or circular erection, as a dome, lantern, or spire; also called PENDENTIVE (Fr. *trompillon*). As 1500-18 in *Accounts of Louth steeple*, "squinch 18 ins. high and 15 at the least"; ARCHÆOLOGIA, 1792, x, 78. Perhaps the "sconce" of William de WORCESTRE, p. 196. SKUNCHION. 16. 17. 19.

The sloping part at the top of a tower from the cornice into the angle of a spire; it is very small at Irochester church, Northamptonshire; *Churches, etc., of N.*, 1849, p. 192.

SQUINT or spying-hole, about 1846 called a HAGIOSCOPE; but it has been argued why a term coined from classic Greek should be used to designate an object purely mediæval. ESCOINSON. SCONSON.

SQUINT QUOIN; see QUOIN.

SQWYER (J.); see SKAYER (J.).

SRIRANGAM, formerly written SERINGHAM. An island in the Carnatic province in Hindostan, opposite the town of Trichinopoly on the river Cavery. A temple dedicated to Vishnu, celebrated for having the supposed identical image of the god Wistchnu which used to be worshipped by Brahma. It has seven square enclosures with walls 25 ft. high and 4 ft. thick, the outer one being about a mile on each side; each enclosure has *gopuras* or gates facing the cardinal points and finished by a lofty tower. About half a mile from the river is another pagoda of less extent but great splendour. FERGUSON, *Pict. Illust. of India*, fol., London, 1847, pl. 21 and 23. FERGUSON, *Indian, etc., Architecture*, 8vo., London, 1876, p. 348, described the 14 or 15 *gopuras*, of which the northern one leading to the river, is 130 ft. long, by 100 ft. in depth, of xviii cent. work. ORME, *Twenty-four Views in Hind.*, fol., 1800. ORME, *Hist. of Military Trans. of Hind.*, 4to., 1763; 4th edit., 8vo., 1803; rep. Madras 1861-2, i, 178. JERVIS, *Journey to the*

Cavery, 1834. THORNTON, *Indian Public Works*, 1875, p. 103. HUNTER, *Imperial Gaz. of India*, 8vo., London, 1881. 50.

SSA; now Sa-el-Hagar; see SAIS, in Egypt.

STAB AND RICE FENCE. In some parts of the high parts of Dumbartonshire, a fence formed of posts of peeled oak, or branches of elm or fir, about 18 ins. from each other, and strongly intertwined with brushwood, or broom; FORSYTH, *Beauties of Scotland*, 8vo., Edinb., 1806, iii, 351. It is called "Stakes and rice", in LOUDON, *Country Residences*, 4to., 1806, i, 214; 219.

STABILITY. In the erection of structures generally, one force has to be constantly taken into calculation—the force of gravity, as the stability of any erection depends on the stability of its centre of gravity, or the common centre of gravity of all its parts. The centre of gravity of any body is said to be stable, when that centre must rise before the whole can be overturned, and unstable when this condition of motion is not necessary. The finding of the stability of any structure, or combination of parts, may be said to consist in taking the resultant of the pressures upon each of the surfaces in contact of the system, and determining the point of application of this resultant, and finding the resultant line of pressure. Practically it is the given strength of the materials, their disposition, and the manner and means of uniting the parts together, that have to be calculated. This embraces what is known as the "equilibrium of structures". The strength and stability of brickwork and of rubble masonry, etc., depends on the mortar used, and the proper bonding of all the courses, more so than in masonry of large stones where each component part of the wall has a separate and individual *vis inertiae* and possesses within itself a considerable amount of stable resistance. The stability of a roof, chimney-stack, factory-stalk, obelisk, or other prominent object to an edifice, meeting the force of the wind, are portions specially demanding the attention of the architect. DOULIOT, *De la Stabilité des Edifices*, 4to., Paris, 1835. EQUILIBRIUM OF AN ARCH. DETRUSION. SHEARING. 1.

STABLE and Stabling (Lat. *stabulum*; s. v. SMITH, *Dict. Ant.*, p. 47b, 61b, 64a; *equile*; Gr. *ippostasis*; It. *stalla*; Sp. *cavalleriza*; Fr. *écurie*; Ger. *pferdeställe*; *marstall*). A building for the accommodation of horses, and cattle. Perhaps the only genuine specimen of an ancient stable now remaining, is on the bay of Centorbi, in Sicily. It is of masonry and vaulted, not divided into stalls except by a swinging-bar, if necessary. The manger is of stone, arched towards the animal to give room for a crib to each. The rope of the head-stall passed through a small aperture in the wall and was fastened by a block at the back of it. It is figured in RICH, *Dict. of Antiq.*, 8vo., 1860; 2nd edit., s. v. *Equile*. The stable formed a very important part of the offices of a house in the middle ages. In the "peles" or small tower-built houses, it occupied the vaulted lower chamber. In the large manor houses, it was placed in the inner court, as at South Wraxall; more often in the outer court, as at Tisbury; frequently detached on the outside of the moat, as at Ightham. At Hampton court it is placed on the opposite side of the green, where it still remains. At Hurley Bottom, Berkshire, it has stalls and woodwork of carved work of Jacobean character, probably continuing an older fashion. At Yanworth, Westmoreland, it is on the opposite side of the courtyard to the house, and the window has a good iron grating of xv cent. work; TURNER AND PARKER, *Domestic Arch.*, 8vo., London, 1859, iii, 166-7.

The considerations in designing a stable at the present time consist of proper structural arrangements to secure the health of the animals. 1. Foundation. 2. Position, and improved arrangements of stalls. 3. Drains for liquid manure, their position, and mode of laying. 4. Bed of the stalls, inclined or level, and mode of laying and its material. 5. Floor, its material, and mode of laying to facilitate drainage. 6. Ventilation; fresh and foul air-ducts. Heating. 7. Reservoirs or tanks for the liquid exuvie, and arrangement. 8. Water, a good supply. 9.

Cisterns for stalls, mode of flushing drains; hose for extinguishing fire, cleaning windows, etc. 10. Hay-racks, saving the seeds; portable racks; corner rack. 11. Manger, shape important, improved mode of filling with corn, etc. 12. Architectural and structural arrangement; position; apartments therein; breadth; double stalls, partitions, infirmary or sick-stalls; Harness-room; Machine-room, boiler-room for hot water, mashes, etc. Windows on pivots, and blinds. Doors. Cleaning-room; verandah outside for cleaning under, glazed or not. It has been stated by KNIGHTLEY that stables should be designed for a small number, high, without lofts over; a coachhouse with loft not communicating with stable; good light, air, and water; a separate lock to each stable and coachhouse; cleaning daily, and removal of dung from yard twice or thrice a week. BYRE. CATTLE-SHED. FARM. HUNTING-STABLE. LOOSE-BOX. MANGER. HARNESS-ROOM. RIDING-HOUSE. RIDING-RING. MENAGERIE. RURAL ARCHITECTURE. 1. 25.

Stalls are usually made 7 ft. long; 7 ft. passage, giving 14, 16, or even 17 ft. in width; 14 ft. passage between double stalls, or 26 ft. width at least. These should be not less than 4 ft. 6 ins. in width; in London 5 ft. 6 ins. is allowed; or 6 ft. 6 ins.; to 7 ft. or 7 ft. 6 ins. for cart-horses. The partitions high enough to prevent the animals putting their heads over; bales, that is, poles hung by short chains at each end, are used in cart-horse stables. Loose-box from 12 ft. to 14 ft. square. The height about 12 ft. to the ceiling. Twelve stalls at most in one stable.

Aspect.—The windows are best facing the east south-east for the rising sun; they should be on side pivots, the top to open inwards. The temperature is best kept at 60° to 65°. For ventilation, sliding gratings each of 100 ft. sup. ins., fixed in the back wall near the ground and behind each stall. Through the ceiling, one or two hoppers, according to the size of the stable, continuing by a trunk through the loft and roof with a covering or exhaust-cap at top. These trunks should have a superficial area equal to the quantity of air let into the stable. The grating and trunk to have means of regulating the temperature and have perforated zinc to divide the air into minute currents. 12 ft. cube of air per minute per horse is recommended.

Water.—9 gallons to each small carriage, 16 to 20 gallons to a large carriage, 4 pails or 10 gallons to each horse, are required at each washing; while 4 gallons more are required with food; GWILT, *Encyc.*, edit. 1876, par. 2223i.

Pavement.—At Brighton, wood block, not worn well; Purbeck horse pitching on concrete, better than common pebbles: one-third of the latter at the head, and two-thirds of the first, would be cheap and wear well; *Papers*, CORPS OF ROYAL ENGINEERS, 4to., London, 1839, iii, 182; also ii, 271; CIVIL ENGINEER, ETC., *Journal*, 1838, i, 391. Indented brick from Buckley mountain, made on purpose, near Liverpool; and 3 in. rough Yorkshire flag behind. Asphalte blocks 1838. Dutch clinkers, and on end, the best. Wilkinson's concrete stable flooring, 1877. Best channelled brick; Welsh brick; Blue Staffordshire brick. Bituminous cements. Adamantine clinkers on concrete. Rammed chalk—clay and smith's ashes—pitched flints—all make good flooring. Iron surface drain with cover to lift off for cleaning. Dove and Co.'s cement concrete.

Fittings; by Cottam; Barton; Varnell at S. Pancras iron works; Musgrave for Cow-house, Stall, and Loose-box; Arthur Young and Co.; and others.

Stables have been formed underground s. v. Fr. *giron rampant*, in Q. DE QUINCY, *Diel. Arch.* At Rome, up a flight of steps of two branches, or inclined plane, MILIZIA, *Lives*, ii, 362. Mews opposite the Quirinal palace, by A. Specchi, *cir.* 1730. 25.

English examples of stables—

1600 *cir.* Peel hall, Bolton, Lancashire. RIMMER, *Old Halls of Lanc.*, 4to., 1852.

1790. Ashstead park, Surrey; said to be magnificent; 1822.

— Lyme hall, Cheshire; BUILDER *Journal*, 1864, p. 47.

1638 *cir.* Wilton house; by S. de Caus; a square court in the middle; AUBREY, *Wiltshire*, 4to., 1847, p. 87.

1840 *cir.* London: for duke of Sutherland, by C. Barry, R.A.; the stables

being all on first floor, coach-houses on ground floor; DALY, *Revue Générale*, 1844, v, 845; pl. 14-8.

— London: Tattersall's at Knightsbridge, by C. Freeman; BUILDER *Journal*, 1864, p. 31.

— " S. Pancras Iron works, over 100 ft. long, having 10 stalls, and 3 loose-boxes; 1870.

1836. " Messrs. Truman's Brewery, Spitalfields; four, each 69 ft. long and 30 ft. wide, 14 ft. high; accommodating 114 horses. CIVIL ENGINEER, ETC., *Journal*, 1837, i, 47-50; ALLOMMEINE BAUZEITUNG, 1838, pl. 218.

— " May Fair; lord Londonderry; BUILDER *J.*, 1883, xlv, 208.

1851. " Batty's Hippodrome at Kensington; BUILDER *J.*, ix, 299.

1864. Newmarket: Rutland Arms Hotel; *idem*, xxii, 587.

1615. Brympton Manor house, near Yeovil. Stables by Inigo Jones; BUILDER *Journal*, 1846, iv, 31.

— Brighton palace; by J. Nash, *Palace*, fol., 1838.

1623-5. Welbeck abbey, Derbyshire; for W. Cavendish, 130 ft. long, 40 ft. wide, for 40 stalls; by H. Smythson.

1877. for earl of Zetland, by Thos. Oliver; very large.

— S. Alban's abbey, for the guests, would hold nearly 300 horses.

1796. Buxton, behind the crescent; ACKERMANN, *Repository of Arts*, 1813, x, 322. By John Carr. The stables were around a central court, converted 1859 into the Devonshire hospital; in 1881 this court, 164 ft. diam. containing about half an acre, was covered in with a dome 138 ft. diam.; the hospital accommodates 300 patients; R. R. Duke, archt.

1863. London: Marlborough house, by sir J. Pennethorne; BUILDER *Journal*, 1863, xxi, 890a.

1839-42. Windsor Castle Royal stables; by sir Jeffry Wyattville. Lower court for 10 loose-boxes for the sick, 15 ft. by 10 ft.; 20 stalls, 3 carriage-houses, break-shed, cleaning-rooms; 19 stalls. Middle court, 4 stables for 25 horses, cleaning-room 16 ft. sq.; 3 loose-boxes; cleaning-sheds. Upper court, cleaning-room, 5 stables for 38 horses. Dormitories for 30 single men over the Riding-house; 54 apartments for married grooms, etc.; mess-rooms, etc. — Badminton, for duke of BEAUFORT, *Stables*, etc., 4to., 1885.

Examples of foreign stables:—

1709-35. } Chantilly, for Louis Jules Henri de Bourbon, for 240 horses, 1719-36. } which from size and architecture are almost entitled to be called palaces; 580 or 600 ft. long, 60 ft. wide, 40 ft. high, in centre a dome 60 ft. diam. and 90 ft. high, by Jean Aubert, for 400 horses, stalls destroyed. *Illustrated London News*, 1847, x, 336; and xi, 244. NODIER and TAYLOR, *Picardie*, fol., Paris, 1835-48, iii. BLONDEL, *Cours*, 1771, iv, 174-7. BUILDER *Journal*, xx, 297. KNIGHTLEY, *Stable Arch.*, 1862.

— Cassel: Vandamme's; MURRAY, *Handbook to France*, 595.

— Rome: Doria Panfilii, by Fuga; LETAROUILLY, pl. 58; p. 67.

— Sèvres and S. Germain en Laye; for Louis XVI, by J. A. Renard. 1679-83. Versailles; 192 ft. long, by ... Mansard, costing three millions, that is now 15 millions; TRAINÉ, *Ancient Régime*, 1876, p. 89. LABORDE, *Versailles*, p. 103. Les grandes écuries pour le roi, and les petites écuries; in King's collection at B. M.

— Louvre; BUILDER *Journal*, xviii, 15.

— S. Petersburg; GRANVILLE, *Guide*, 1855, i, 543. Cavalry barracks, RUSCA, pl. 1.

— Tenno; xv cent. castle of Marino Marzano, duke of Sessa, for 300 horses.

1725. Vienna; imperial, for 600 horses, by J. B. Fischers; the front 1,200 ft. long, for 400 horses, by J. E. Fischers.

— Maisons sur Seine; château; by F. or J. H. Mansart; BLONDEL, *Cours*, iii, 236; King's collection at B. M.

— Pommersfeld; in KLEINER's work, 1738.

— Aleksandrov, Stabling or Haras. 50.

— Saumur; for cavalry, very large and magnificent.

— Wiesbaden; marstall in palace; ALLO. BAUZ., 1842, pl. 437.

— Berlin: Thierarzneischule; stallungen; *idem*, 1843, pl. 497.

— Zweibrücken: Stallgebäude für edle pferde; *idem*, 1844, pl. 623.

LECLÈRE, *Recueil*, fol., Paris, 1826, pl. 112, shows five examples of stables in Italy. D'AVILER, *Cours d'Arch.*, 8vo.

1710, p. 185*, p. 13. SAVOT, *Arch. Franç.*, 8vo., 1685, i, 109; 111; NORMAND, *Paris Moderne*, 4to., Paris, 1849, iii, 89.

The following list includes some publications on Farm stabling not mentioned s. v. FARM. DAY, *The Race Horse in Training*; in ARCHITECT *Journal*, 1880, p. 272. MAYHEW, *Illustrated Horse Management*, 8vo., 1864; and BUILDER *Journal*, xxii, 365; 422. KNIGHTLEY, *Stable Architecture*, fol., London, 1862. MILES, *Gen. Remarks on S. and Stable Fittings*, 8vo., 1860; and BUILDER *Journal*, 1861, xix, 198. STEPHENS, *Book of the Farm*, 8vo., 1851, 2nd edit., i, 299; 377. STEPHENS AND BURN, *Book of Farm Buildings*, 8vo., 1861. STEWART, *Stable Economy*, 6th

edit, 1854; FITZWYGRAM, *Horses and Stabling*, 1869, 1881; reviewed in *ATHENÆUM Journal*, 1869, No. 2197, p. 729. TATTERSALL, *Sporting Architecture*, 4th, 1841. YOUTT, *The Horse, its History, Management, and Treatment*, 8vo., London, 1853; new edit, by CECIL, with *Cavalry Horses*, 8vo., 1855. GAMGEE, *Plain Rules for the Stable*, 2nd edit., 8vo., 1866. DEAN, *Const. of Farm Buildings and Cottages*, 1849. KERR, *Gentleman's House*, 8vo., 1871, 3rd edit., p. 257. NEVILLE, *Farms and Farming*; also *Horses and Riding*, 8vo., 1884. DENTON, *Farm Homesteads, Plans, etc.*, 4to., 1864. HAYCOCK, *The Gentleman's Stable Manual; Construction of the Stable*, 8vo., 1859; and *BUILDER Journal*, xvii, 724-6. MORTON, *The Prince Consort's Farm*, 4to., 1863; and *BUILDER Journal*, xxi, 96. VERELST, *Remarks on Farm Buildings and Stables*; 1856, *idem*, xiv, 701. *Inhabited Stables and Evils*; *idem*, 1857, xv, 662, 694. MORTON, *Resources of Estates, etc.*, *Farm Buildings*, 1858; *idem*, xvi, 365. *Destroying Stable Snells*; *idem*, 1861, xix, 504. *Farm Stabling*, *BUILDING NEWS Journal*, 1860, vi, 568-9; *How to Build a Stable*, from Harney, 1870, xviii, 413.

STABLE (master), was 1519 surveyor to "my lord of Northumberland"; SURTEES SOCIETY, *Sanctuarium Dunelmense*, 8vo., 1837, p. 86.

STACK of chimneys (Fr. *foyer*; *cheminée*; Sp. *chimenea*). Several chimneys collected into one mass. The flues 1624-32 came in front of each other, afterwards, i.e., before 1672 they were placed obliquely (*dévoiyé*). While at Venice the chimneys were in the thickness of wall and funnels *pierced* the walls outside, which was not to be done in Paris. The *manteau* now advances little and only wants a *chambranle* and the *tableau* over. LE MUET, 1623, transl. by PRICKE, *Art of Fair Building*, fol., 1670, shows on the first-floor plan, a narrow flue as long as the fireplace; see preface. VIOLET-LE-DUC, *Diet. Rais.*, s. v. *Cheminée*. *Illustrations*, s. v. *Chimney-shaft*.

STACKELBERG (OTTO MAGNUS, baron von), born 1787, at Reval; 1810 was in Greece with Brøndstet, Nors, von Haller, and C. R. Cockerell. He published *Der Apollotempel zu Bassæ*, etc., fol., Frank., 1826. *La Grèce, Vues Pitt.*, etc., edited by Rossignol, fol., Paris, 1829-38; 1834. *Die Græber der Hellenen*, fol., Berlin, 1837. *Costumes et Usages des Peuples de la Grèce moderne*, fol., Rome, 1825, in German *Trachten*, etc., fol., Berlin, 1831-6. He died 1837 at S. Petersburg. 68.

STACKELSCHNEIDER or Stackenschneider. He studied in the academy at S. Petersburg; was 1837 presented by the emperor with a gold casket in recognition of his design for the Colonna palace. He designed the summer palace for the duke of Leuchtenberg; 1840-44 the Mario palace by the Blue bridge for the duke; with many other buildings and hôtels in the city. 68.

STACKING or PILING. Deals and timber have to be placed in a yard with due regard to the means of drying, by having a free current of air on every side; the top end resting against a rack (called sticking), the other end on the ground; or flat with a lath between each tier. Wyburg and some other Russian goods are more affected by the sun, than are the Swedish. Square Timber is best preserved in salt water, as when piled the sun much affects it; *BUILDING NEWS Journal*, 1874, xxvi, 310. SEASONING TIMBER. PEARO.

STACK YARD or Rick yard. The open place, usually on the north of the farm buildings, where agricultural produce is stored in heaps or stacks. These are sometimes placed on frames, or on STADDLES, and on the former they have been placed on a tramway and so brought from the yard, to be thrown direct into the thrashing-machine. A stack is about 17 ft. by 17 ft.; the rick cloth being 18 ft. by 24 ft. FARM. GRANGE.

STADDEL, stadel, staddle, stack stool, stackstead of stone, stathel, stavel, standing stool, crock, and PATTEN. A short pier of brick, stone, or iron, put to support the sill of a wooden building above ground so that it may be removed as a tenant's fixture. INSTITUTE OF SURVEYORS, *Transactions*, xii, 53. Elwes v. Maw (East's Reports, iii, 38). "Frames supported by stone or ARCH. PUB. SOC.

iron pillars about 18 ins. from the ground with flat caps, to prevent the access of rats and mice"; PENNY CYCL., art. Suffolk, p. 213. *Moule Anglais*, in *LA PROPRIÉTÉ Journal*, 4to., Paris, 1833, pl. 23, ii, 94. STEPHEN, *Book of the Farm*, 8vo., 1851, i, 380. ACCESSIO. DUTCH BARN. RICK STAND.

STADIUM. The Roman name (Gr. *stadion*) for the large open space used for foot-racing, wrestling, and suchlike games. The HIPPODROME was used for horse-racing and had the *spina* and *carceres*: perhaps in some places they were used for both purposes. It often formed part of the Gr. GYMNASIUM, as at Thebes; and of the Roman THERMÆ. PALESTRA. It was so named from the famous one at Olympia (where it was separated from the hippodrome by the *stoa* of Agnaptos), which measured exactly one stade, equal to 125 paces, 600 Greek or 625 Roman ft., or 606½ Engl. ft., from the flat end to the angular masonry at the curve of the other end. The width of the area of these structures are not usually given, that at Aphrodisias was 116 ft. 9 ins. and 262 ft. externally, by 749 ft. and 894 ft. 6 ins. The stadium was a long narrow area having a straight line at one end and a semicircle, *funda*, at the other; seats at the side or sides. This semicircular end is supposed to have been used for other sports; it is found at Ephesus (Roman), Athens, and Messene, the last having 16 rows of seats. The Roman stadium was usually circular at both ends, as at Laodicea, Pergamos, Aphrodisias, Tralles, and Magnesia ad Meandrum. At Laodicea and at Ephesus, one of the circular ends was made into a circle or oval by building a curved wall across the breadth of the stadium. At Magnesia, Tralles, Sardes, and Pergamos, the theatre was placed on one side; and at Aizani, at one end, of it.

Laodicea (IONIAN ANTIQUITIES), gives the simplest form of the Greek stadium, as nature gave the required shape. At Olympia, Thebes, and Epidaurus, it was formed on the side of a hill with a raised mound on the other. The Pythian at Delphi, and the Panathenaic at Athens, were formed of mounds on both sides and covered with marble seats; the last has nearly disappeared. On the isthmus of Corinth was one of white marble; at Delphos, at first of stone, afterwards decorated with Pentelic marble by Herodes Atticus, and said to be very large. There are other examples at Nicopolis, Hierapolis, Alabanda, Orgyia, Aizani, Aroura, Sardes, nearly 1,000 ft. long, Perga, Antiocheia ad Meandrum, Cibyra now Buraz in Lycia, still in considerable preservation, Ephesus, Athens (Woods, *Letters*, ii, 267), Sicyon (*idem*, 302), Rome, of Domitian for 30,000 persons, now the piazza Navona, and Smyrna. LEAKE, *Peloponnesus*, 8vo., London, 1846, p. 78-81.

The hepta-stadium at Alexandria was the mole or causeway, so called, as also tetra-stadium, joining the end of the island of Pharos to the mainland, 7 stadia or nearly ½ of a mile long; SHARPE, *Egypt under the Ptolemies*, 4to., 1838, p. 38. It was said to have been designed by DEXIPHANES or Dexiophanes of Cnidos. It was increased in breadth by many additions and now forms the base of the chief part of the modern city.

STADLER (CHRISTIAN). He studied at Vienna and in Italy; and designed 1807 the fine *rathhaus* at Graetz, besides many mansions and houses. 68.

STADLER (HANS CASPAR), practised at Zurich. His son FERDINAND, born 1815, studied under him, and then under F. von Gaertner at Munich. He designed the monument to Nägeli at Zurich. Another son AUGUST, born 1816, also studied under his father and Gaertner; gained 1840 the large medal of the Berlin academy; and the second premium for the new exchange (designed by Stueler); and designed several houses and mansions. 68.

STAFF. The board joined to another laterally to form a hollow cylinder, cone, etc., for the shaft of a wooden column, or for any other purpose. ANGLE BEAD; ANGLE STAFF or staff bead; BEAD; and SQUARE STAFF. The staff carried by an abbot was plain and turned inwards, as showing domestic rule; that of a bishop is enriched and turned outwards, as indicating external rule. 1. 2.

STAFF; see JACOB'S STAFF.

STAFFORDSHIRE BRICK. A hard vitrified BLUE BRICK. PAVEMENT.

STAFFORDSHIRE GRATE; see GRATE.

STAGE. A step, floor, or story. In a theatre, it is the sloped flooring on which the performers act. A stage on a new principle, another stage being formed under the usual one on which to work machinery for extra effects, was made by Fechter at the Lyceum, and is explained in *ALL THE YEAR ROUND Journal*, 1863, Oct., p. 229-33. Also the apparatus used in building up concrete walls. A temporary formation of timber for public use during the time earthwork may be consolidating, is also called a stage. The travelling concrete stage on the Main Drainage works; in *BUILDER Journal*, 1862, xx, 242.

In mediæval architecture, it is the part between one set-off of a buttress and the next. Also the horizontal division of a window intersected by transoms; as in WILLIAM OF WYCESTRE, p. 287. 1. 17. 19.

STAGNATOIO or Stagnuaio (DOMENICO), is probably the same as MATTEO (D. DI).

STAIN. Colour applied to some soft material to give another tint to it. Thus deal and timbers of roofs and floors, can be made to have the appearance of oak, mahogany, rosewood, and walnut. Having a clean face, it is stained with the liquid, then allowed to become quite dry; then sized (glue size is best); and when quite dry, varnished once or twice as desired. The wood should not be treated with the size and varnish in one coat as it never looks well: and it is argued that the wood should be sized first to prevent the stain sinking in; *BUILDER Journal*, 1860, xviii, 843. The process was introduced by Naylor; followed by Stephens, about 1860 by Swinburn; and 1879 by Benson. Other stains are made by a solution of asphaltum in boiling turpentine to imitate oak; raw umber and a small portion of blue-black in strong size; and common coal ground in water, used as any other colour (*NOTES AND QUERIES Journal*, 1st Ser., 1853, vii, 559). A weak solution of sulphuric acid in water washed over the wood will blacken it to any depth of colour by repeated applications. Benson's stain is said to require only beeswax or turpentine to flooring, no varnish. A brown stain is obtained by Condry's fluid; *B. J.*, 1861, xix, 116, 152. "Bodley's mixture" is Prussian blue and burnt umber, producing a deep greenish brown, which is effective, and may be relieved with gold; *ASSOCIATED SOCIETIES, Reports and Papers*, 1878, xiv. BYRN, *Art of Varnishing, etc.* 12mo., New York, 1853. Mahogany has to be stained and bodied to make it look well; this often dries out and is then required to be redone; *BUILDING NEWS Journal*, 1874, xxvi, 50. STUART, *Dict. of Arch.*, 8vo., 1833, s. v. Wood. Several patents have been taken out from 1859 for staining and figuring wood (*B. J.*, xvii, 640).

The stain in plaster from smoked bricks may be prevented by well-haired cinder-ash mortar; the purer the ash and the larger the quantity used with the hair, the better. A slate fixed against the bricks and plastered over. Cow-dung pargetting used for the first coat of plaster: and, once coat the brick well with cow-dung diluted in water applied with a brush; *BUILDER Journal*, iv, 465; xi, 524; 556. Such bricks should be worked with the smoked face inwards; *idem*, xiv, 508; xvi, 209.

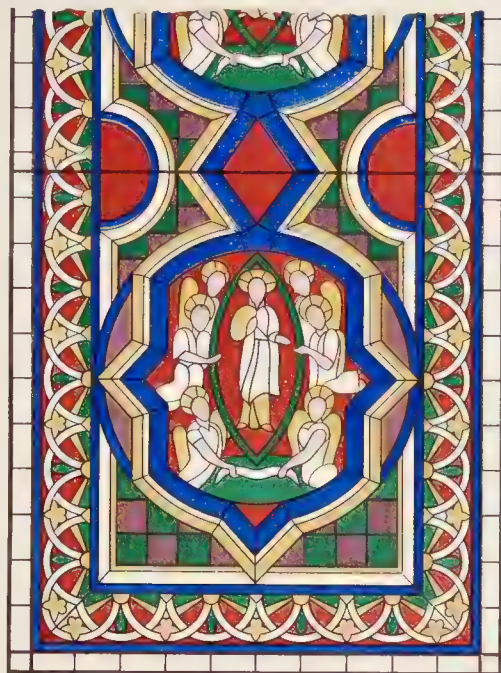
The ancient practice of staining marble is described in the *ATHENÆUM Journal*, reprinted in *CIVIL ENGINEER, etc., Journal*, 1841, iv, 103. STATUE colouring. W. Byrd of Holywell, Oxford, stonecutter, in March 1657, found out the painting or staining of marble; *Wood, Oxford, 4to.*, 1773, p. 253, edit. by Peshall. *Art of Colouring Marble*, UNIVERSAL MAGAZINE, 1755, xvi, 175. The marble mural monument to Mary, countess of Stafford, in S. Edmund's chapel, Westminster abbey, was "stained by Robert Chambers"; ACKERMANN, *Westm. Abbey*, fol., 1812, ii, 113. To take smoke-stains out of marble, it should be covered with soap lees thickened with whiting and allowed to remain for a week to a month or more. Others are given s. v. Marble.

STAINED GLASS, sometimes called PAINTED GLASS. *LYD-GATE, cir.* 1400, called it "roial glass". There are three modes of colouring glass. The first is called POT-METAL glass, in which the colour is mixed up with the materials while in a molten mass, so that the whole is impregnated with the colour. The second is covered, coated, or FLASHED GLASS, which is formed by uniting a thin layer of coloured glass with another layer either colourless or of a different colour. The third is PAINTED GLASS, the surface of the white, *i.e.*, colourless glass, being painted; the colour or pigment is burnt in, in a kiln, in a similar manner to enamel painting, the colouring materials being in all cases metallic substances. There is another, that of colouring the surface of the glass by varnishes, but this is destroyed by the action of the weather in a few years as the varnish peels off. In the third process, the painting endures nearly as long as the glass itself, if it be properly done. Three different systems are pursued under this head; namely (1) the mosaic method; (2), the enamel method; and (3), the mosaic enamel method. The first is the simplest and the best. After the design has been made, the full-sized working drawing (cartoon or *vidimus*) is prepared, on which are marked the sizes and shapes of the various pieces of glass, which are then cut out of the pot-metal glass corresponding to the design. These pieces of glass are then laid upon the drawing, and the pattern or figure traced upon the glass with enamel brown. An easel formed of large pieces of glass held in a frame facing the light is then used, the pieces intended to form the design being attached to the easel by wax or by strips of paper. The artist proceeds to fill in the shadows, and to harmonise the various tints as much as possible with enamel brown, which is the only enamel colour used in the mosaic method; any part of white glass being stained yellow, or parts of blue glass green, by floating over the surface a solution of silver, which will give the yellow tint when burned. The coloured surface of flashed glass may be eaten away and the white glass beneath exposed to view in particular portions by the application of fluoric acid. The artist having finished his work, the glass is taken from the easel to the furnace, where the colour and the stains are burned in. The pieces are then united by CAMES or the leadwork, and fixed to the openings by copper wire around the saddle-bars. Under the second or the enamel method, the design is painted on white glass with enamel colours and stain; but the great fault of this method is that the enamel is not so transparent as the coloured glass, and the colours are not so brilliant and pure as the mosaic. The third or mosaic enamel method is a combination of the two above described. *GRISAILLE. CATHEDRAL GLASS. QUARRY.*

The "yellow stain"; the removing the coloured surface of "flushed or coated" glass so as to expose the substratum of white; and obtaining a certain variety in the shade of colour by choosing a piece of glass irregularly coloured in its manufacture, these are all the resources which the mosaic method places at the glass painter's command; what may be achieved by such means in skilful hands is sufficiently shown by the specimens at the east end of Lichfield cathedral. There are satisfactory reasons for considering the mosaic method to be the true method of glass painting; and perhaps there is no modern improvement upon it except the occasional use, by the Munich glass painters, of an enamel of a different colour from brown for shading purposes; WINSTON, *Remarks on Painted Glass at Lichfield*, at the *ARCHÆOLOGICAL INSTITUTE*, 1864; the last paper by the author. 14.

Up to XIV cent. pot-metal was used; in that century it was in great part superseded by superficially stained or coated glass; in XVI cent. enamelling was used; cameos with subjects and arabesques replaced the architectural details of xv cent. 1250-75 the use of painting lines instead of lead appears.

Illustrations; Assisi, pt. ii, 1848-9 (No. 232). Painted, pt. i, 1863-5, pl. 137 (No. 214). Grisaille, pt. ii, 1861, pl. 101, 102 (Nos. 164 and 165). REYNOLDS, *Windows of New College, Oxford*, by M. Jervaise, 14 pl., fol., 1785, 1795. FOWLER, *Stained Glass*





from York Cath., Lincoln, Aston Hall, etc., fol., 1798-1821. ASHLEY, *Painting on Glass*—1500, 4to., 1801. OLIPHANT, *Plea for Painted Glass*, 12mo., 1855. HAWKINS, *Hist., etc., of Gothic Arch., and of Glass*, 8vo., London, 1813. (WINSTON), *Enquiry into the Difference of Style observable in Painted Glass, especially in England; with Hints on Glass Painting, by an Amateur*, 8vo., Oxford, 1847. WINSTON, *Memoirs illustrative of Glass Painting*, 8vo., 1865. WINSTON, *Application of Painted Glass to Buildings in Various Styles of Architecture*, read at Royal Inst. of Brit. Architects, *Sessional Papers*, 1853-4. SHAW, *Encyclopædia of Ornament*, fol., 1842. WARRINGTON, *History of Stained Glass, etc.*, fol., 1848. MORANT, *Indications of Date*, 8vo., 1870. GILBERT, *Fragments regarding the History of Stained Glass, etc.*, part 1 only, 4to., n. d. A. A., *Intro. to the Study of Painted Glass*, 8vo., 1878. W. GIDDE, *Receipts for the True Making of Colours for Glass*, 1616; British museum, Add. MS. 6763, f. 60; also *Receipts* xv cent., MS. of xvi cent. at Bristol, *idem*, Sloane collect., No. 3661, given in *Architect Journal*, 1850, ii, 547. BALLANTINE, *Treatise on Painted Glass, in each Style of Architecture*, fol., 1845; *On Stained Glass Windows*, read at Edinburgh; *Church Builder Magazine*, 1876, p. 108-16; and BALLANTINE and ALLEN, *Fragments regarding the Windows of the House of Lords*, fol., Edinb., 1844; HANCOCK, *Amateur Pottery and Glass Painter: with Directions*, 1879. CARTER, *Ancient Painting, etc.*, fol., 1780, ii; 2nd edit., 1838. MERRIFIELD, *Arts of Painting, etc.*, xii to xviii cent., 8vo., 1849. NISBETT and FRANKS, *Slade Collection of Glass*, fol., 1871.

Illustrated Catalogues of 1851, 1862, and later Exhibitions.—ENCYCL. BRIT., 8th edit., p. 660, 667. LIVERPOOL ARCH. SOCIETY, *Proceedings*, i, 85, and later. ARNOLD and ELMES, *Magazine of the Fine Arts*, 4to., i, 1821. WEBB, *Cont. Ecclesiology*, 8vo., London, 1848, p. 333, good details at Florence.

CIVIL ENGINEER, *etc.*, *Journal*, 1846, ix, 149, *Foreign Painted Glass*; 56 a portrait on late Roman Glass. 1853, xvi, 169-72, HOWARD, *Stained Glass as a Means of Decoration*. 1862, xxv, 321, 336, PELLATT, *On St. and Painted Glass in Exhibition*. *Builder Journal*, 1852, x, 656, 701, 798, *Cinque Cento Glass*. 1857, xv, 493, POWELL, *On Stained Glass*. 1861, xix, 490, 529, 598, POOLE, *Old and New Stained Glass*. 1862, xx, 735, PELLATT on Exhibition. *Building News Journal*, 1864, xi, 370, POOL, *On Painted or Stained Glass*; xi, 517, GAMBIER PARRY, *Glass Painting*. 1872, xxiii, 306, BARFF, *Sixth Cantor Lecture*. 1875, xxviii, 358, CAMM, *S. and P. Glass*; 452, 531, *S. and P. Glass*. 1875, xxix, 136, LOFTIE, *Canterbury Cath.*, xiii cent. *ECCLIOLOGIST Journal*, ii, 155, and iii, 25, *Glass in S. Margaret's and Tattershall Churches*. 1849, vii, 81-97, *On work by Warrington*. 1852, xiii, 237-47, and 258, STREET, *On Glass Painting*. ASSOCIATED SOCIETIES, *Reports and Papers*, 1851, i, 100, by C. Anderson; iv, 161, by J. H. Powell; vi, 53 and 195, by G. A. Poole. 1866, p. cxxxiii, *Fairford Glass*, Worcestershire, fine late xv cent., captured 1492 in a Spanish ship from the Netherlands; (also BIGLAND, *Fairford and its Glass*, 4to., 1791). 1871, p. 57-67, by H. Usher. 1878, p. 52-6, *Renaissance*, by F. H. Sutton. Various papers, as King's College Chapel, xii, 153-172; 357-73; xiii, 44-61, in *Journal of the ARCHÆOLOGICAL INSTITUTE*; also of the ARCHÆOLOGICAL ASSOCIATION.

DELSAUX, *S. Jacques à Liège*, fol., 1843. GUERBER, *Vitraux de la Strasbourg Cath.*, 8vo., 1848. BULTEAUD, *Descr. de la Cath. de Chartres*, 8vo., 1850. CAPRONNIER, *Vit. de Tournai*, fol., 1850. DESCHAMPS, *Vit. de Tournai*, fol., 1846-8. HUCHER, *Calques des Vitraux peints de la Cathédrale du Mans*, fol., 1865. MARTIN et CAHIER, *Cath. de Bourges*, xiii siècle, fol., Paris, 1841-4. MARCHAND, BOUSSÉ et MANCEAU, *Ver. du Eglise de Tours*, fol., 1849. LEVY et CAPRONNIER, *Hist. de la Peinture sur Verre en Europe, part. en Belgique*, 4to., 37 pl., 1860. DU SOMMERARD, *Album*, ch. vii, pl. 1, *renaissance*, text, v, 135-43. WARING, *Arts connected with Arch. in Italy*, fol., 1858. WEALE, *Works of Early Masters in Christian Decoration*, Gouda, Liège, etc., fol., London, 1861. THIBAUD, *Notice Historique sur les Vitraux*, 8vo., Cler. Ferr., 1842. VIEL, *L'Art de la Peinture*

sur Verre, etc., 1774. A. LENOIR, *Hist. de la Peinture sur Verre, etc.*, 1803, vi. LANGLOIS, *Sur la Peinture sur Verre, anc. et mod., etc.*, 8vo., Rouen, 1832; 8vo., 1800; transl. by GRIFFITHS, 8vo., 1803. OUDIN, *Traité d'Arch. et de Peinture sur Verre*, 8vo., 1845. BATISSIER, *Hist. de l'Art Mont.*, 8vo., 1845. A. LENOIR, *Instructions sur la Peinture sur Verre*; in *Bulletin du Comité Historique des Arts et Monuments*, 1847. GESSERT, *Art of Painting on Glass or Glass Staining*, 8vo., Stutt., 1839; translated by POLE, in WEALE, *Quarterly Papers on Architecture*, 4to., 1844. BASTENAIRE D'AUDENART, *Art. de la Vitri.*, Paris, 1825. *DIC-TIONNAIRE des Arts et Manufactures*, 1853. LASTEYRIE, *Hist. de la Peinture sur Verre, etc., en France*, fol., 1843. MINUTOLI, *Art of Staining Glass*, 4to., 1836. EGGERT, *Stained Glass Windows of Maria helf Kirche, Munich*. BONTEMPS, *Examen des Verres, etc.*, 8vo., 1851. HOPE, *Glasgimalde zu Kilndown* (Munich Glass), fol., 1853. LACROIX, *Les Arts du Moyen Age, etc.*, Ser. 2, 8vo., 1869-71. JESSEL, *Glasmalerie, etc.*, 60 pl., 4to., Berlin, 1886. BLANCOURT, *De l'Art de la Verrerie*, 8vo., Paris, 1697, 1718; transl., *Art of Glass, and making all sorts, painting, etc.*, 8vo., London, 1699; reprinted 1886.

Glass Painters.—GENTLEMAN'S MAGAZINE, 1817, lxxxvii, 309-15. BRITTON, *Exeter Cath.* BROWNE, *York Cath.* SURTEES SOCIETY, *Fabric Rolls of York*. BRAYLEY and BRITTON, *Palace at Westminster*. SMITH, *Antiq. of Westm.* WINSTON, *Hints on Glass Painting*. VASARI, *Lives*, s. v. Marcillat; MARGHESE, *Lives*, 8vo., Dubl., 1852, i, 295-315; and ii, 180-96. WALPOLE, *Anecdotes, etc.* DALLAWAY, *Anecdotes of the Arts*. HOBBS, *Picture Collector's Manual*. MERRIFIELD, *Arts of Painting*. *Foreign*.—GESSERT; LASTEYRIE; LE VIEL; LANGLOIS. WARING, *Arts, etc.*

STAIR, STEY, usually STAIRS (It. *scala*; Sp. *escalera*; Fr. *échelle*; *dégré*; Ger. *steigen*). The series of tread and riser, the two making a STEP, in a flight of stairs, usually enclosed in a structure or cage called a STAIRCASE. Its various parts are described s. v. riser, tread, nosing, string, cut string, carriage, pair, degree, gradarium, gradus, grees, foot-pace, landing, flight, half-pace, quarter-pace, winder, flyer, handrail, baluster or banister, bulk-head, newel.

The varieties, as *Straight*; always fly; i. e., 1, direct or plain flyers, as to garret or cellars; 2, square flyers, round a square newel, either open or solid; 3, triangular flyers, round a triangular newel, open or solid, as at the cupola of Sta. Maria Rotunda, and S. Apostolo; 4, French flyers, being a flight, a square half-pace leads to another flight, and a square half-pace leads to a third flight which is parallel with the first one. Dog-legged; Double. *Winding*; as round a circle, an ellipse, geometrical, an oval, spiral, a square, or triangle; and these again round a solid, or open, newel; (belfry, turret, vis or vice, caracole, helical, turapike, cochlea, cockle, corkscrew, ascensorium); in the former, the solid newel is usually made $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ ths of the diameter of the whole staircase according to its size; round an open newel, PALLADIO says it should be half the diameter. *Columnated window stairs*—as to the portico of Pompey at Rome, set on columns for the light to come in at all parts; another was made by Lazzari Bramante in the Belvedere of the Vatican, perhaps the two flights of semicircular steps which VASARI states were removed for the staircase about 1550 by M. A. Buonarrotti, as shown in *Illustrations*, pl. 116, s. v.; and at Pisa, in the campanile to S. Nicola, cir. 1270, by N. Pisano; round a central well formed by marble columns and arches, which was followed by Bramante, and by A. (Piccone) de Sangallo. Also one at Venice. D'AVILER, *Cours d'Arch.*, 4to., Amst., 1699; and VIRLOYS, *Dict. d'Arch.*, 4to., 1770, name the many varieties of the time. It has been surmised that the mode of setting out stairs as described in VITRUVIUS, ix, ch. 2, is for a circular staircase only. 1. 4. 14. 19.

External stairs; see PERRON. At Persepolis, the steps of the great stone staircase are formed of blocks of calcaire gris spathique, comprising two, three, and four steps, each step being 24 ft. wide, 4 ins. rise, and as stated in TEXIER, *Arménie, etc.*, 1842-52, with 7-in. treads: he also gives 58 as the number of

steps, whereas the section shows only 34 on each side. GUILT, *Encyc.*, quoting the account by DE BRUYN, 1737, and others, states the width to be 25 ft. 7 ins., the steps 4 ins. high, with 14-in. treads, and 55 on the north side, 53 on the south; the upper flight of 48 in number are cut out of single blocks of the rock. The account in RAMÉE, *Histoire*, 1843, differs altogether except as to the rise of 4 ins. The total height of the staircase as given in TEXIER is 33 ft. 4 ins., which would allow of 100 steps. MYERS, *Remains of Lost Empires*, 8vo., 1875, 327. FERGUSSON, *Ill. Handbook*, 8vo., 1855, i, 190. At Benares, facing the river, called *ghaut*. WOODS, *Letters*, 4to., 1828, ii, 310, gives plans at *Malta* of the stairs in front of the palace of the governor and the "magnificent" one at the Albergo of Castille. In London, to the London university, Gower street, by W. Wilkins, R.A.

Venice; the Giant's stairs at the doge's palace.

Syracuse; in court of house in via Amalfitania, *Illustrations*, iii, 1851-2, No. 89.

Lubeck; Hôtel de Ville, XIV cent.: MOYEN AGE MONT., iv, pl. 47, No. 332.

Rome; Trinità del Monte.

Ana Capri; having ascended a great height, it is reached by 552 steps cut out of the rock in a serpentine direction; it is called La Scalinata; the town is nearly 2,000 ft. above the sea.

Poggio a Cajano; Lor. de' Medici, for the stairs to his palace, availed himself of a painting by Stefano, *cir.* 1340; also repeated at *Orieto* by A. da Sangallo.

Athens; the approach to the Acropolis.

Spiral slope or inclined plane, as a sort of staircase. Besides the examples given under the term CORDONATA or stepped plane, the following may be mentioned.

Venice; To the top of the campanile of S. Marco; CICOGNARA.

Jeyore; Slopes instead of steps.

Murcia; In the belfry of the cathedral.

Viterbo; The palazzo S. Martino, by which a carriage may reach the upper stories.

Rome; Bramante executed behind the pavilion of the great belvedere of the Vatican, the staircase four orders, highly praised by SERLIO, *Archit.*, fol., 1663, p. 219; by LETAROUILLY, *Rome Moderne*, fol., 1840-60, p. 334; and given in SEROUX D'AGINCOURT, *History of Art*, fol., Lond., 1847. The cordonata or *scala a bastoni*, to the back of the palazzo Barberini; and the *scala lamaca* to the palazzo Carpi, afterwards Scavolino; both by F. Borromino. The sloping way up on to the roof of S. Peter's for the use of mules carrying materials. In more than one house, the mode of ascending and descending is by a winding level of stone or concrete from top to bottom; it also occurs in houses in Malta and in Sicily.

Orieto; The well enclosed in a circular structure with two spiral staircases a *cordoni* for mules, of 248 steps one above the other; HARE, in GOOD WORDS JOURNAL, 1874, p. 195.

Alatri; The ancient approach to the town, said to be the earliest instance of a cordonata; HARE, in GOOD WORDS JOURNAL, Aug. 1873, p. 567.

Naples; Behind the choir of S. Barbara; 158 or 187 steps leading to the top of the campanile by Giov. da Pisa, or Guil. da Maiano.

Cairo; Outside a minaret; and one to a well (28).

Toulouse; Old palace, by which guns can be taken up.

Berlin; Old royal schloss, from ground-floor to the principal story, by which the horse could be brought to the king's apartments.

London; Some modern examples occur, as the vehicular entrance to the underground warehouses of the Smithfield meat market.

Double flight of stairs. Wressle castle, Northumberland, *cir.* 1512. Tower Harem *Valayet*, Ispahan, said to have been done by the apprentice unknown to the master; LANGLOIS, in CHARDIN, *Voyage*, 4to., 1769, vii, 445, 450. *Arbilla*, PENNY CYCL., 250. *Liege*, from the choir to its upper story, of the church of S. Jacques, considered a masterpiece of construction. *Beverley* minster, north aisle of choir, Early English. *Paris*, north-east corner of the palais royal, is one in a large open space surrounded by houses whose rooms are accessible from it; persons ascending on one side can, with difficulty, see those descending on the other side. "Twin stairs" by Banks, ILLUSTRATED LONDON NEWS, 1851, xix, p. 155. *Dover*; for access to the western heights. *London*; the School Board offices on the Embankment, by E. Bodley. The Courts of Justice, one within the other; by E. Street, R.A. At the château de Chambord,

near Blois (but given by PALLADIO, *Architettura*, book 1, as having four staircases winding separately); and stated to be by Pietro del Bergo and Jehan Cossin, in WOTTON, *Ground Rules*, in LEYBOURNE, *Mirror*, 4to., 1721, p. 52, called Sciamburg.

Descending stairs, in thickness of a wall, at Tower Barclay castle; BILLINGS, *Baronial Antigs*, 4to., 1847-52, iv.

Full. At Chelmsford, 1856; BUILDER JOURNAL, xiv, 151. London Polytechnic Institution, *idem*, 1859, xvii, 26, 45, 48, 139, 271; 1861, xix, 218, 270; at Cork, *idem*, xvii, 48.

Fireproof Construction; B. J., 1858, xvi, 197, 252. B. N. J., 1857, iii, 515.

STAIRCASE (Fr. *cage de l'escalier*). A term applied to the whole set of stairs, with the walls supporting the steps leading from one story to another. In large mansions the staircase gives access to the first floor only; at other times to the second floor also; in ordinary houses to the whole series of stories. In a grand staircase only one turn is usual, and that occurring on a half-space, or pace, or landing. The lighting of a grand staircase is most appropriately effected by a skylight or lantern-light. The following instances are recorded of a staircase having been forgotten to be provided, as by THOS. LEVERTON; by Faulkener, Swift's printer at corner of Essex street, Dublin (BUILDER JOURNAL, 1865, p. 893); and to the Tolbooth at Glasgow, built 1626, a large stone stair had to be erected outside, *idem*, 1877, xxxv, 664. At the Lyceum theatre, London, the stairs to the upper gallery. 1. 2. 3. 4. 6. 14. 19. 25.

Karnak, at Meedinet Haboo.

Edfou, or Apollonopolis Magna.

Selinuntum, round, in Temple on the Acropolis.

Agrirentum, straight, at temples to Juno and Lucina, Concord, Hercules, and Esculapius. Faso, etc., ii, pl. iv; and iii, pl. iv; v, pl. 43; and GOLDICUTT, *Sicily*.

Berenice troglodytica; staircase has three inner and as many outer chambers. A. P. S.

Halicarnassus now Boudroom; 29 ft. wide, 12 steps; PULLAN, Photographs, Asia Minor, 1876.

Antwerp Cath. Dog-legged with two newels, B. J., 1847, v, 51.

Berlin; Iron stairs in a dome; ALLO, BAUT., 1841, pl. 399. New museum by Stueler; finest in Europe, having the paintings by Kaulbach, D'ANVERS, *Elem. Hist. of Art*, 8vo., Lond., 1874, p. 109.

Naples. Many good ones by F. Sanfelice. Palazzo des Etudes, LECLERC, *Recueil*, pl. 67.

Vienna; University by Forsttel.

St. Petersburg; in residence of the family Beloselski Beloserski, the most beautiful in the city. A. P. S.

Rouen, north transept, BUILDER JOURNAL, x, 488; to Library, MOYEN AGE MONT., xv cent., ii (18), 105; external, xv cent., Palais de Justice, *idem*, ii, 38 (96).

Caen, part external, xv cent., MOYEN AGE MONT., ii, 222 (77).

Sens, treasury.

Troyes, the Calvary; rood loft in Madeleine. } NODIER ET TAYLOR, Reims, hospice; and one open, of south tower. } Champagne. GAILHA-

Châteaudun; château des Contes de Dunoy, XVI cent., MOYEN AGE MONT., iii, 321, 298, 382, 387, 369, 376, 329 (pl. 42-8).

Narbonne, musée

Nantes

Morlaix

Kéroulreil manorhouse

Sassas, near Narbonne; museum; *idem*, Languedoc, ii, pt. 1.

Angers, now museum; *Illustrations*, i, 1849-50, pl. 86 (No. 238).

Strasbourg. In a house very near the cathedral. At each angle of the tower of the cathedral.

Toledo, S. Cruz, VILLE AMIL, i.

Escorial, in Spain.

Burgos, Le puerta Alta, in cathedral; VILLE AMIL, ii.

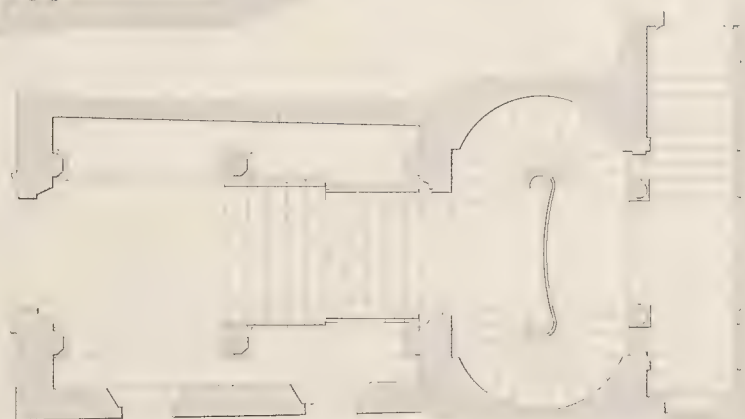
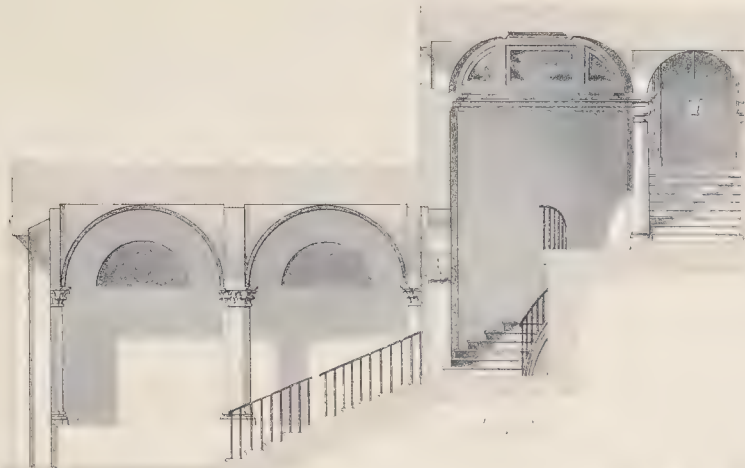
Barcelona. House of provincial Assembly, *Illustrations*, iv, pt. 3, pl. 88, s. v. Court.

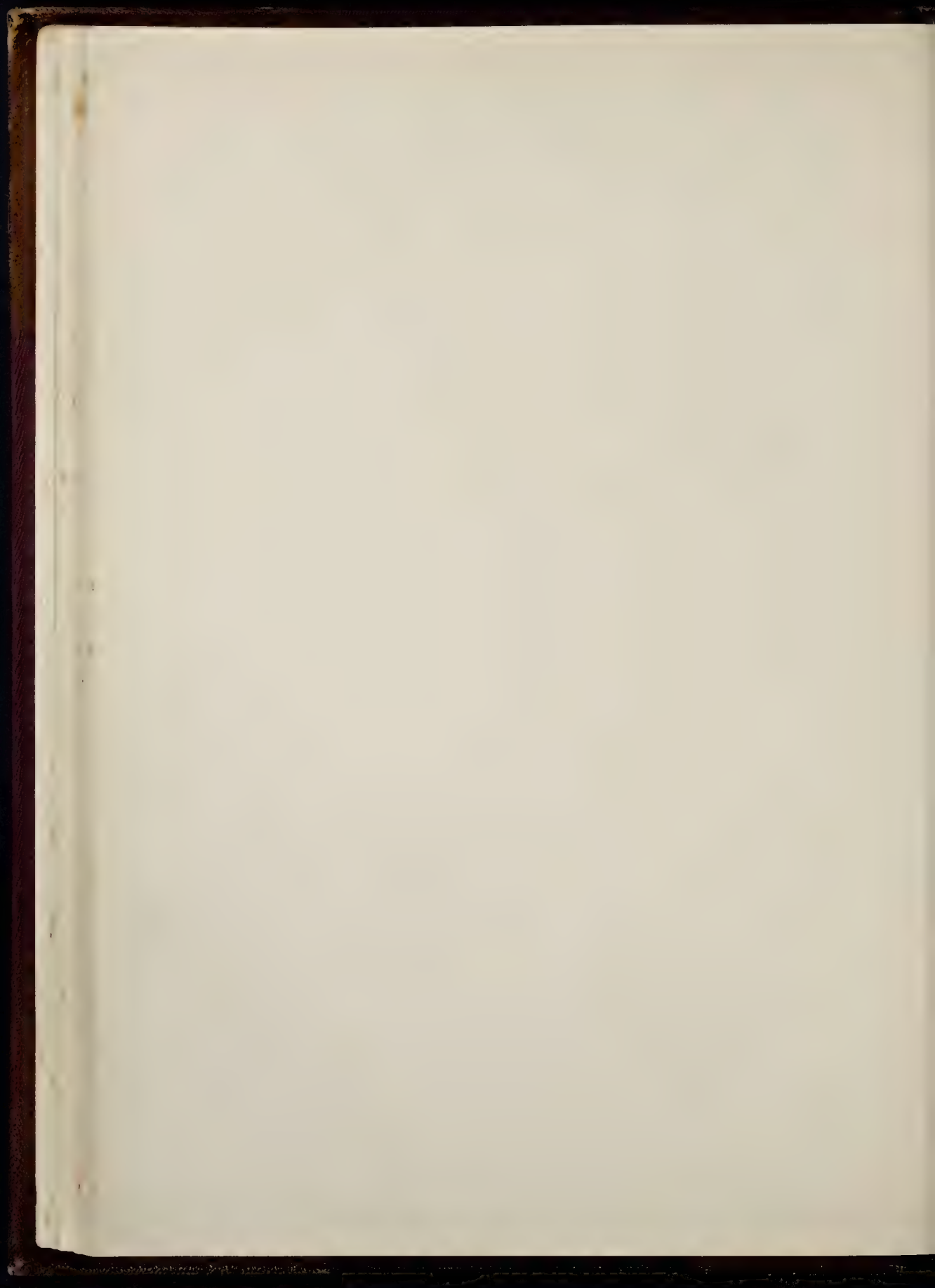
Pampluna cathedral, VILLE AMIL, iii.

Venice; La Scala del Bovolo, ALLGEMEINE BAUZEITUNG, 1842, pl. 455. Palazzo Pisani, *Illustrations*, i, 1849-50, pl. 51 (No. 239). Monastery near church of S. Giorgio Maggiore, probably by V. Scamozzi, attributed to A. Palladio; *Illustrations*, i, 1848-9, pl. 23 (No. 236). At the Senators' palace.

Urbino; ducal palace by Francesco di Giorgio; the staircases were more beautiful and convenient than any that had been constructed till that period, *cir.* 1450-70 (also attributed to Luciano, B. Pintelli, and L. B. Alberti).

PLATE VI

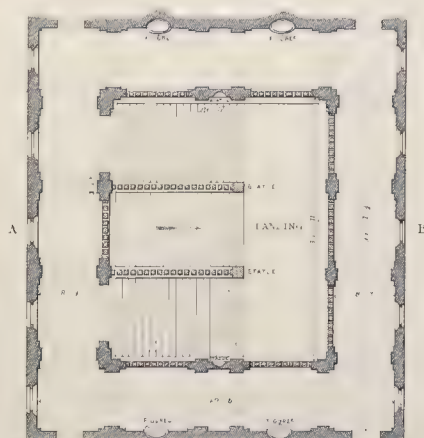




STAIRCASE.



SECTION A-A



PLAN

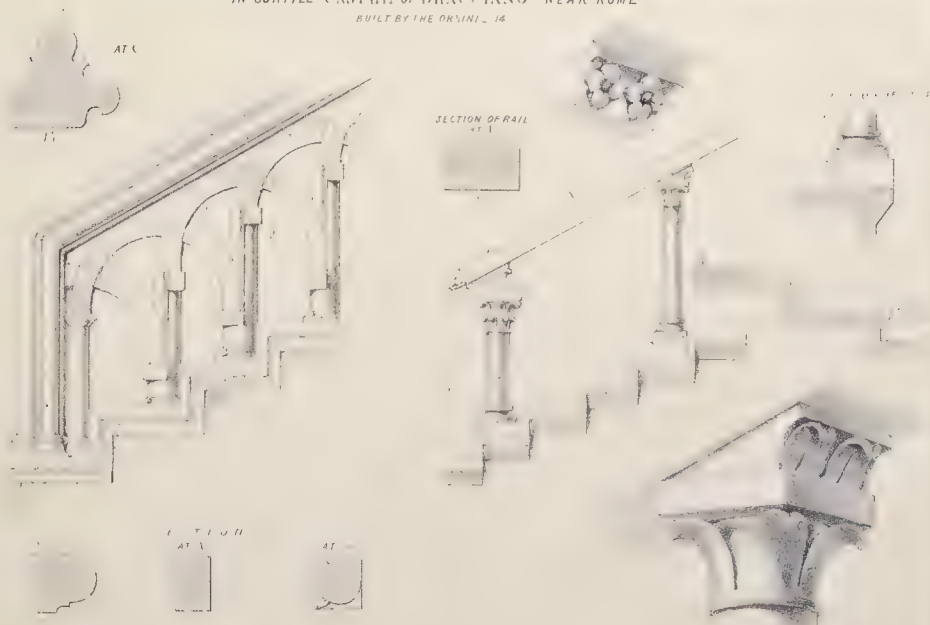
PALAZZO ERCELEO
BOLOGNA

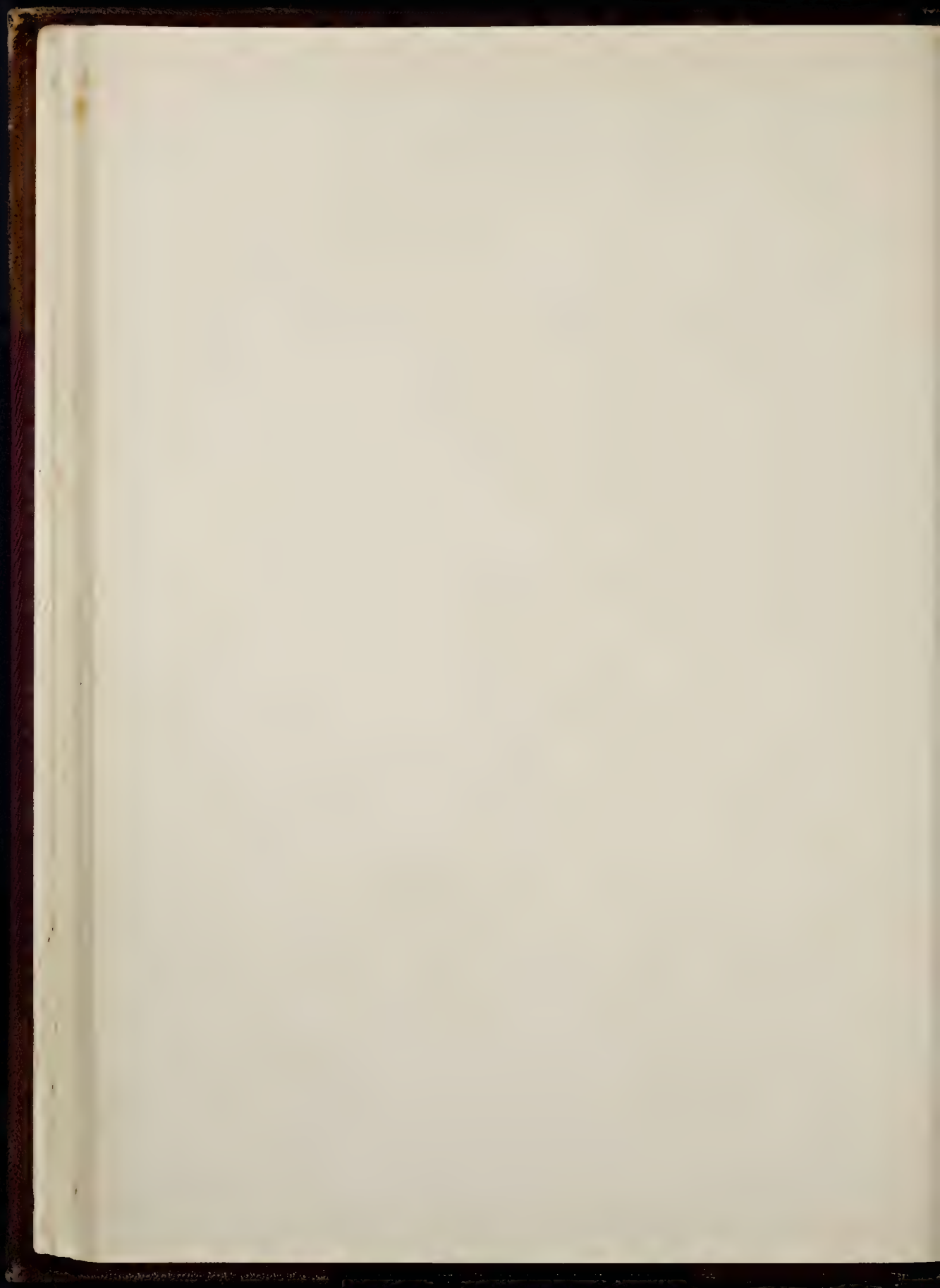


STAIRCASE

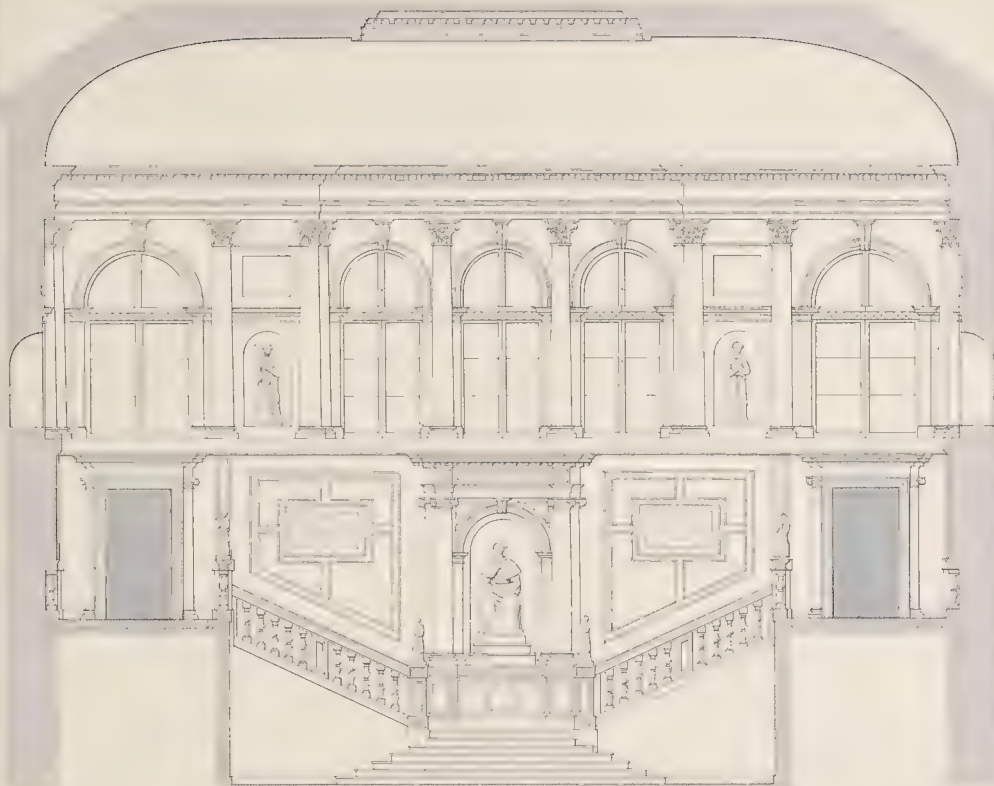


IN CORTILE CASTLE OF BRACCIANO NEAR ROME
BUILT BY THE ORSINI, 14

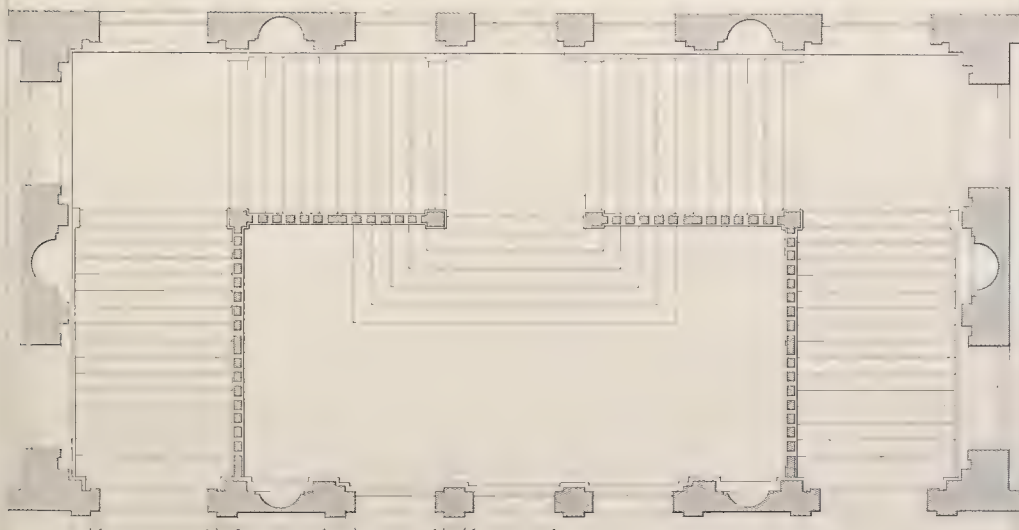




STAIRCASE



SECTION
MONASTERY ADIO N. VS. THE CHURCH OF SAN GEORGIO VENICE

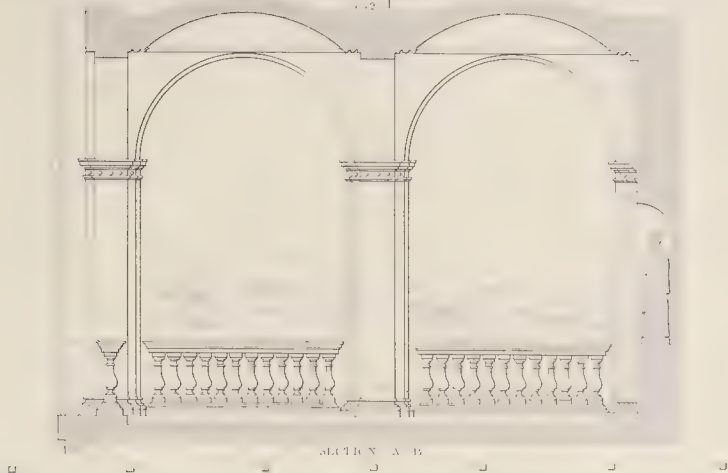


PLAN

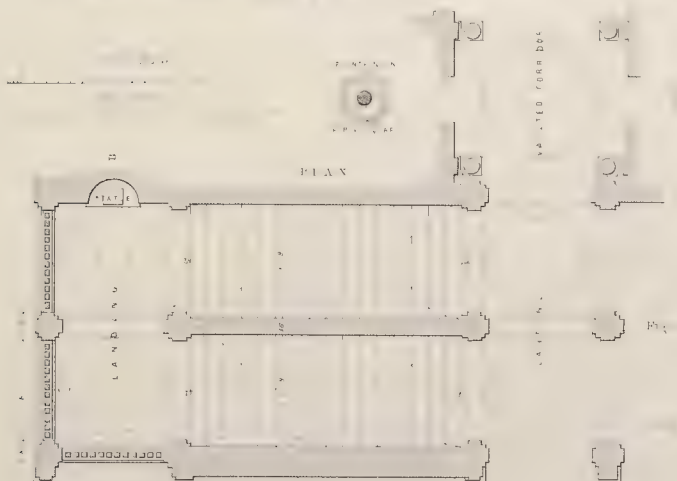
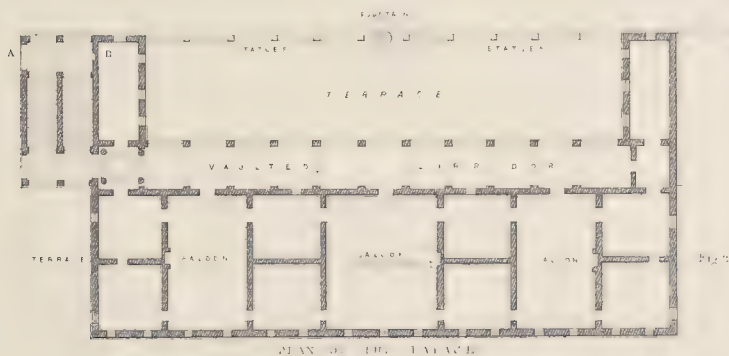


STAIRCASE

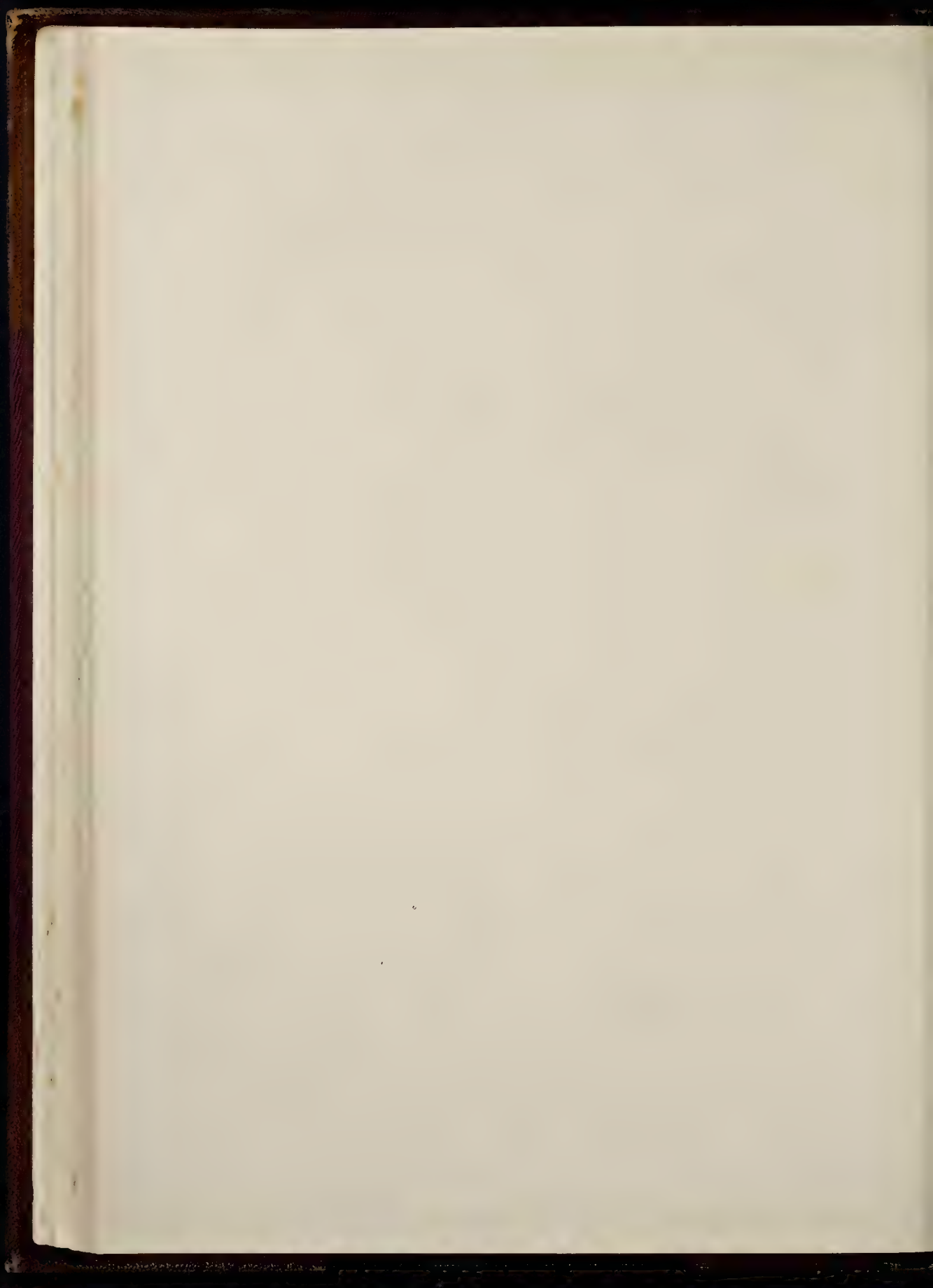
FIG. 1



H. A. A. D. E. N

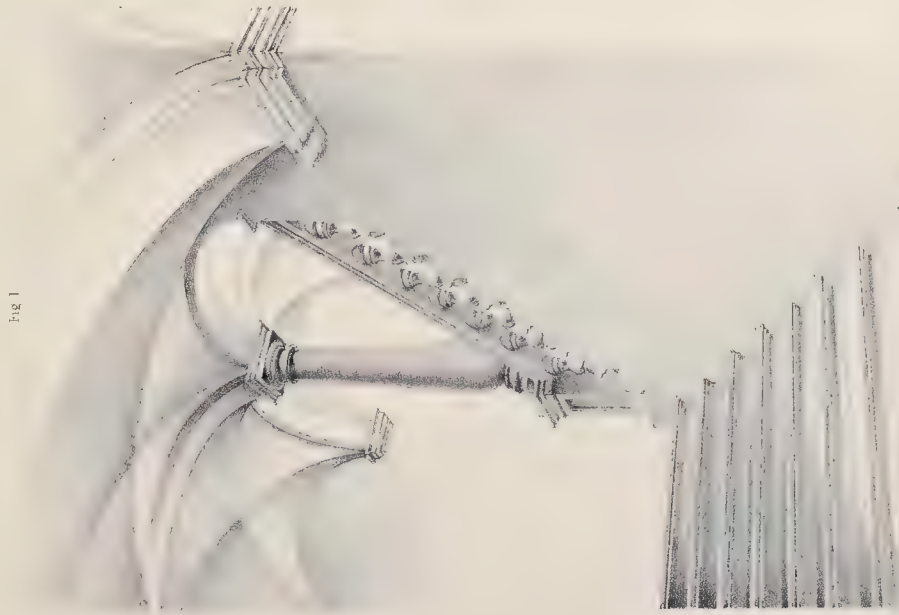


PALAZZO LANCELOTTI VELLETRI



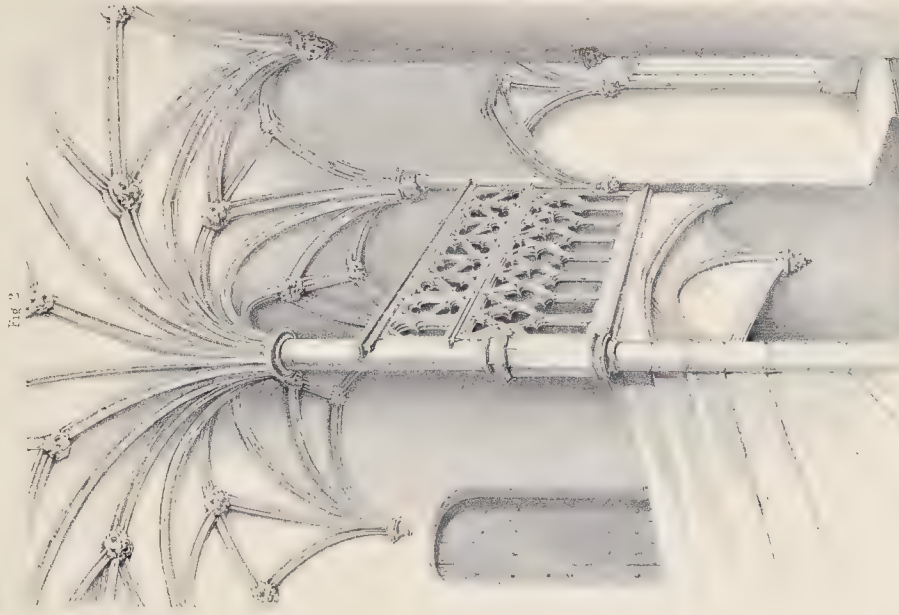
STAIRCASE

Fig 1

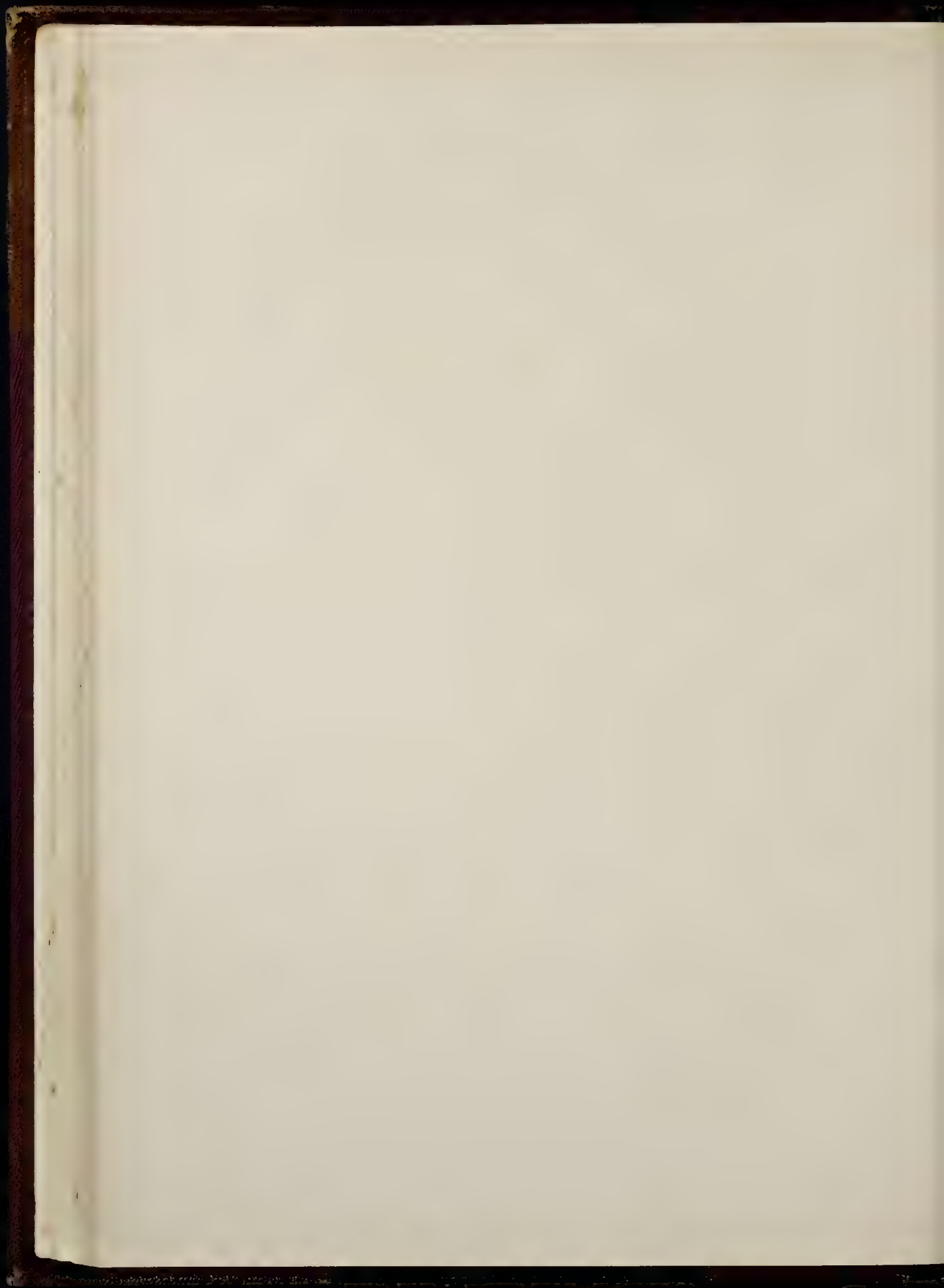


GEN. A

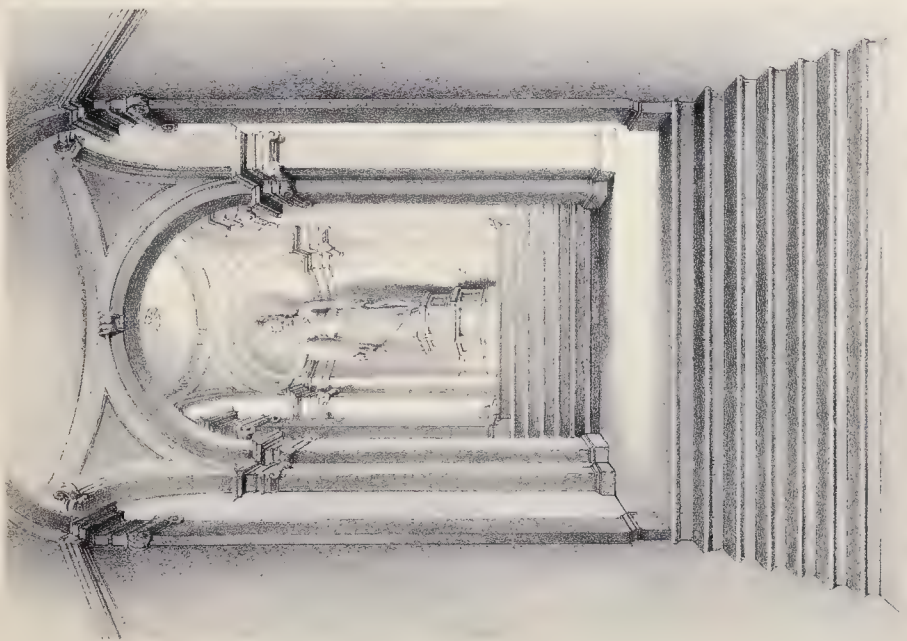
Fig 2



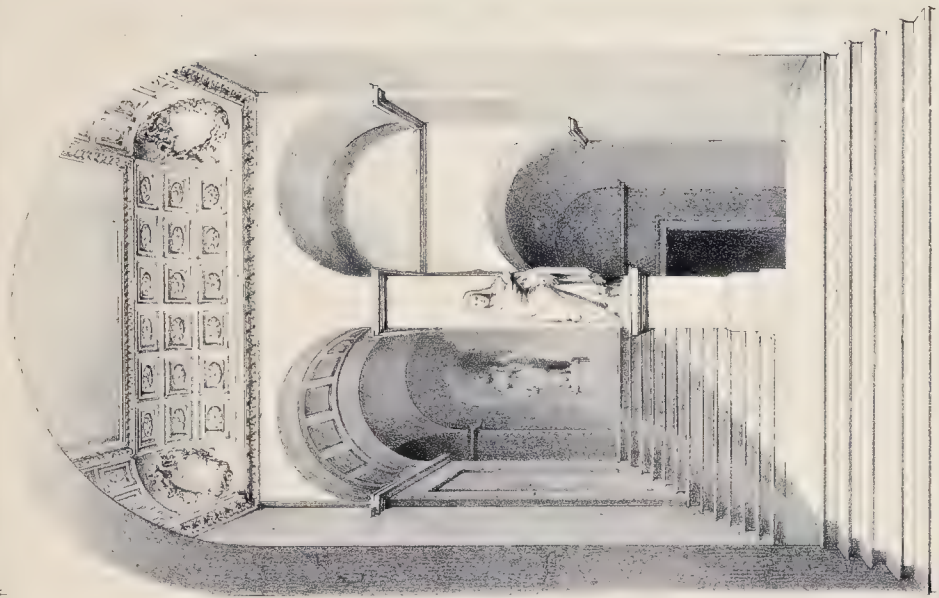
GEN. B



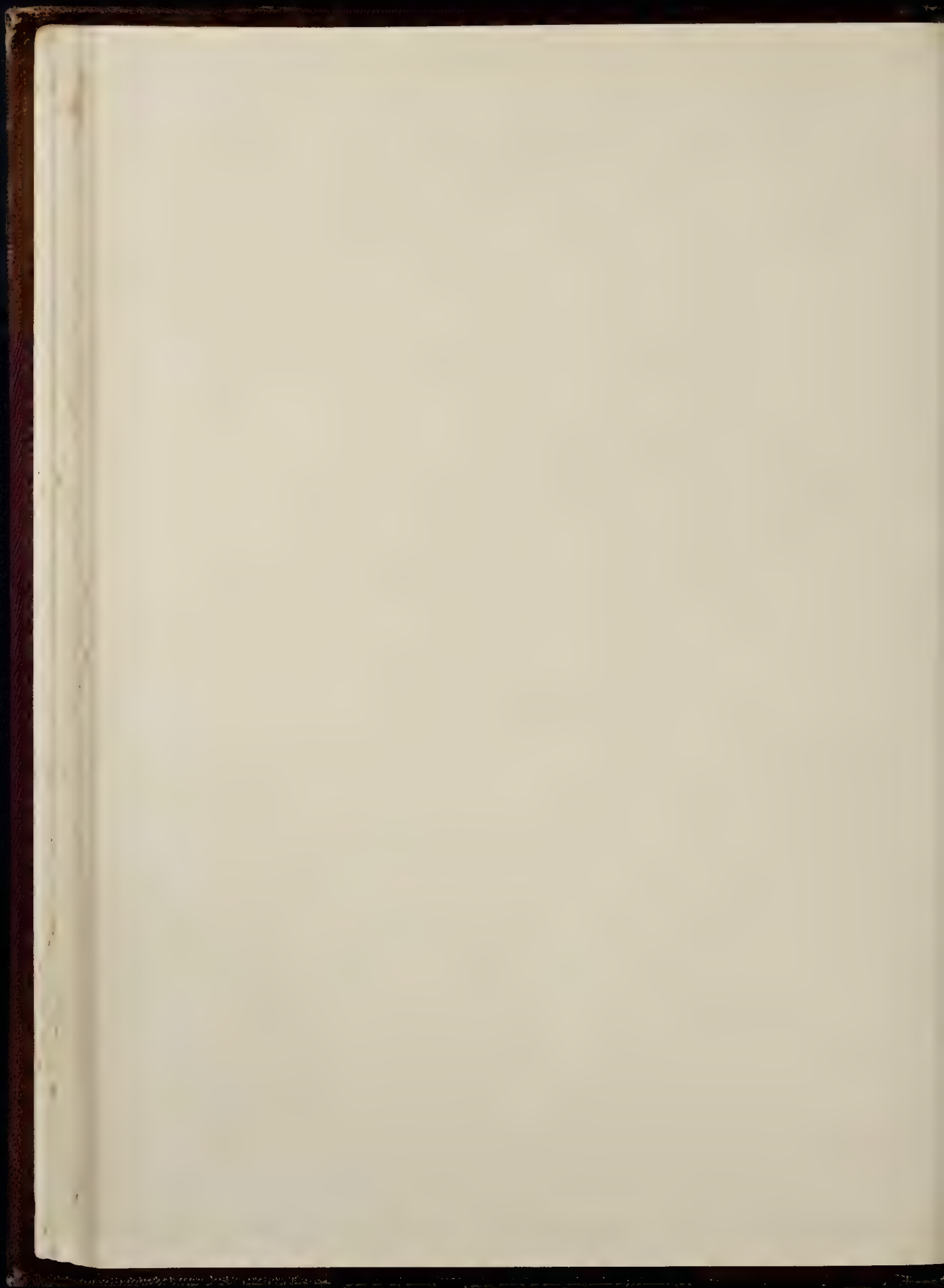
STAIRCASE



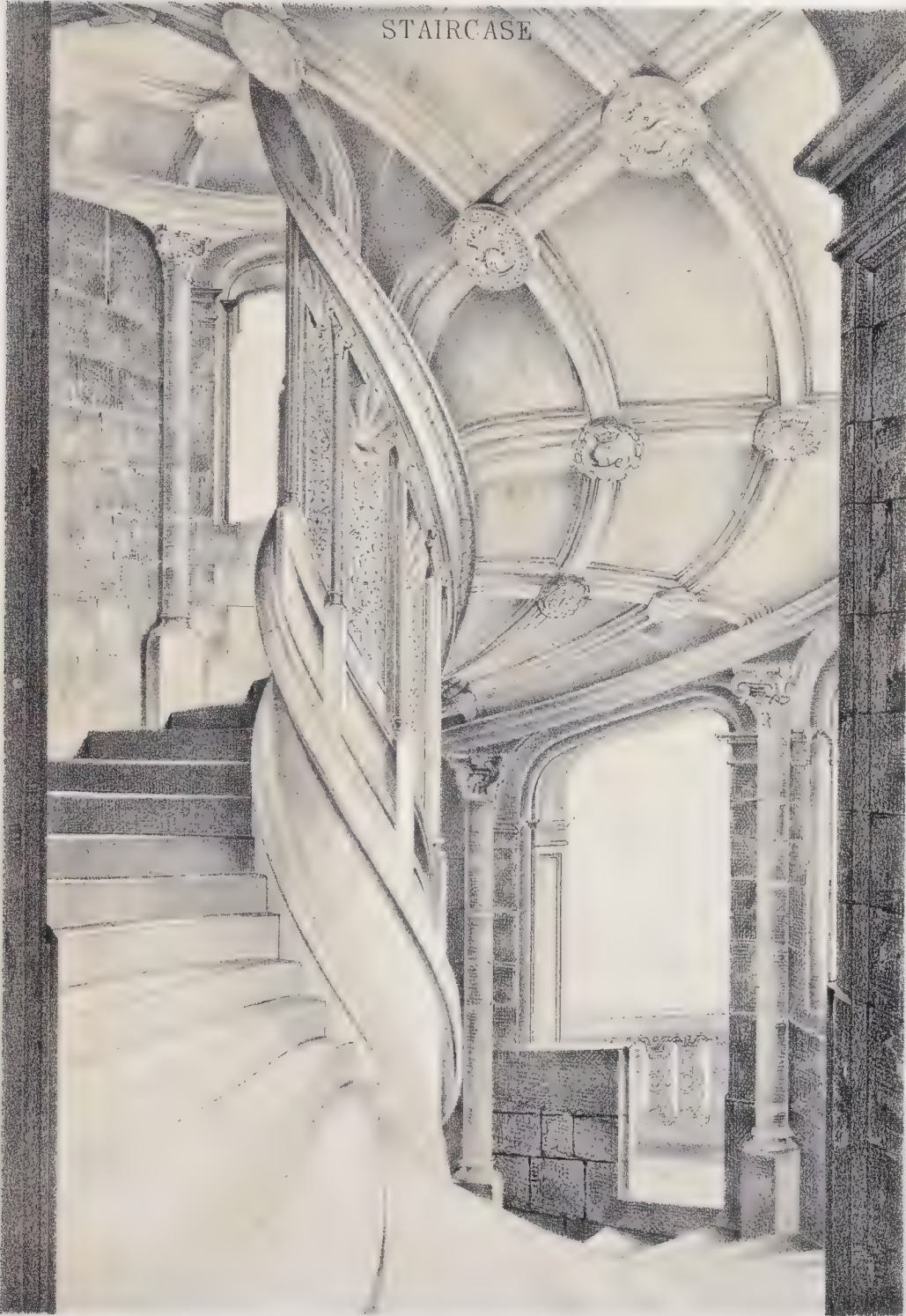
PALAZZO PISAN, VENICE



PALAZZO GRASSI, ROME

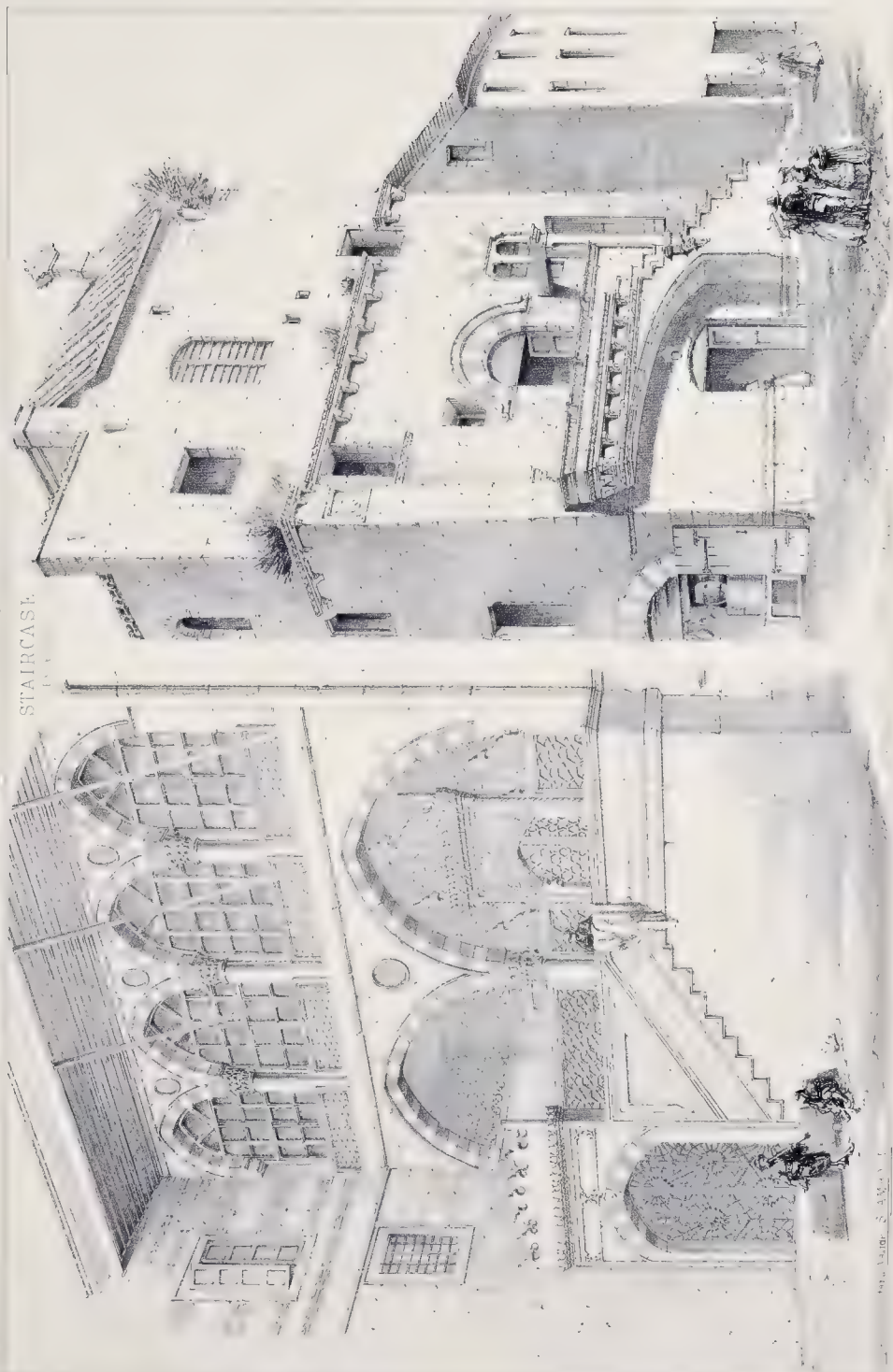


STAIRCASE





STAIRCASE





Pesaro, a house in the ducal park, by Gir. Genga; a spiral staircase similar to the Belvedere in Rome, the palazzo Borghese, and the "most beautiful" one by Bernini in palazzo Barberini.

Munich, royal library, *BUILDER Journal*, xxi, 682 and 28.

Rome. Scala santa, designed by D. Fontana, having three flights, the centre one of 28 steps is said to consist of the steps of the Prætorium, passed over by our Saviour at Jerusalem, and sent to Rome by Helena. Woods, *Letters*, 4to., i, 389. TAPPEN, p. 160. LETAROUILLY, *Rome Moderne*, fol., p. 493.

Also at Rome; the palazzo Mattei di Giove, pl. 164, p. 362; Borghese, pl. 175, p. 376; Barberini, oval, pl. 184, p. 394; Fonseca, pl. 191, p. 404; Corsini, pl. 192, p. 408; Braschi, pl. 196, p. 415; and *Illustrations*, i, 1849-50, pl. 51 (No. 239); Farnese, pl. 118, p. 281; Scala regia at the Vatican (OPTICAL ILLUSION); pal. Ruspoli, splendid marble; *Handbook Central Italy*, 1849, p. 451, 537. Forum Romanum, by Bernini; *Illustrations*, i, 1848-9, pl. 12 (No. 233); pal. Belvedere. The Vatican.

Florence, Ducal palace; "the staircases by G. Vasari are exceedingly commodious, inasmuch that he who ascends them, attains the highest floor of the building almost without perceiving that he has ascended"; PIACENZA, in VASARI, *Lives*, v, 548; pal. del bargello, 1367; its original is said to be in the courtyard of the castle 1274 at Poppi, near Bibbiena.

Bracciano, Castle of the Orsini, xv cent., *Illustrations*, i, 1863-5, p. 11; No. 235. Modena, cathedral; *idem*. Assisi, San Francesco; *idem*.

Genoa, *idem*, i, 1849-50, pl. 96, No. 238. Palazzo reale.

Velletri; pal. Lancelotti, one of the best in Italy; *idem*, ii, 1848-9, pl. 37, No. 237.

Bologna; pal. Ercolani, restored by Venturoli; *idem*, ii, 1849-50, pl. 38, No. 234; also in LECLÈRE, *Recueil*, fol., pl. 21: another pl. 14.

Viterbo; *idem*.

Milan; town hall, pedestal. Caprarola.

Constantinople; Mosque Sultana Valide; *idem*, ii, 1861, No. 241.

Bois, cir. 1520, restored 1847 by Dubau. DALY, xiv, pl. 21. *Illustrations*, ii, 1849-50 (No. 240). Chambord, two flights as mentioned s. v. STAIR.

S. Gilles, near Arles, ESTRANGIN, *Arles*, 1845, p. 227.

Randan, château de; NODIER ET TAYLOR, *Auvergne*, i, p. 1.

Lavardin, château de.

Toulouse, at capitol, for heavy guns with a wellhole.

Fontainebleau. Chenonceaux. Versailles.

Soleure; said to be a marvel of art.

S. Cloud, château by J. H. Mansart; BLONDEL, *Cours*, v, 122, pl. 61.

Paris. Tuileries; and Louvre, by Metzeau (p. 77b); Palais royal; hôtel des Monnaies. La Chapelle palatine; GAILHABAUD, *Mons*, etc. Hotel de Ville, *ILLUSTRATED LONDON NEWS*, xix, 220. *Les Anciens Escaliers du palais et le nouvel escalier du musée de Versailles*, DALY, *Revue Générale*, 1855, xiii, pl. 9-12, p. 50. Hôtel de Cluny. Luxembourg. Cour des Comptes. New Opera-house. Trocadero.

Ashpitel on Staircases, 4to., 1851, pl. 4-15, gives examples at Audley End; Old Manor house, Yatton Kennell, Wiltshire; Charlton house, near Greenwich, Kent; Great Ellingham hall, and Attleborough church, Norfolk; Dorfold house, Cheshire; Clare hall, and Catherine hall, Cambridge; Cronwell house, Highgate, 2 plates; East Sutton, Chandos street, by I. Jones; Charter house; and Robert Shaw's house in Petticoat lane.

Canterbury, Norman to registry; walls to roof have been lowered, *BUILDING NEWS Journal*, 1872, xxiii, 306.

Aberystwith; College; by J. P. Seddon; B. N. J., 1871, xx, 278.

Lanarkshire, Hamilton palace, black marble; B. J., 1868, xxvi, 948.

London. Northumberland house, pulled down. Montague house, pulled down. Buckingham palace. British museum. Foreign Office, by G. G. Scott, R.A. Stafford house by duke of Sutherland. Reform clubhouse. Junior United Service clubhouse, by Nelson and Innes, *BUILDING NEWS Journal*, 1857, iii, 380. New royal staircase at the Houses of Parliament, inquiry by a committee, report thereon, wherein Mr. Barry defended his design, steps having 5 in. rise with 16 in. tread; *CIVIL ENGINEER*, etc., *Journal*, 1844, vii, 219-22.

PALLADIO, *Architettura*, fol., 1570, was the first to write on staircases. NORMAND, *Recueil d'Escaliers en Pierre*, in *Le Vignole des Architectes*, 4to., Paris, 1838; and in *Le Vignole des Ouvriers*, pt. 4, 4to., Paris, 1828. KERR, *Gentleman's House*, 8vo., 3rd edit., 1871. ROMBERG, *Zimmerwerkes Baukunst*, 15 pl., 4to., Leip., 1846-50. MANDAR, *Études d'Arch.*, fol., Paris, 1826; pl. 48. KRAFFT, *Corporation*, fol., 1805; and *Charpente*, fol., 1819-22. RONDELET, *L'Art de Bâtir*, fol., pl. 144-7. HOPPUS, *Gentleman's and Builder's Repository*, 1748. LECLÈRE, *Recueil*, fol., Paris, 1826, gives pl. 21, four at Rome; pl. 56, place at Portici; pl. 58, 67-9 at Naples; and many others, besides those named in text. MARWICK, *On Staircases*, in *BUILDING NEWS Journal*, 23 May 1884, p. 807. SMIRKE, *Lecture* at Royal Academy, *BUILDER Journal*, 1859, xvii, 108; and 1862, xx, 234. AITCHI-

ARCH. PUB. SOC.

SON, *Two Lectures* at ditto, 1855, *idem*, xlviii, 395-6. ASHPITEL, *Book of Lines for Carpenters*, 4to., 1857. FANSON, *Some French Châteaux*, at Royal Inst. of Brit. Archts., *Sessional Papers*, Dec. 1855. MILLIN, *Dict. des Beaux Arts*, 8vo., Paris, 1806. NASH, *Mansions of England*, fol., four Series, 1839-49. SHAW, *Elizabethan Arch.*, 4to., 1839. MOXON, *Mechanick Exercises*, 4to., 1679, p. 151-5, explains the "solid newel, open newel, and mixed neweled stairs", leaving others to the books on architecture. BROWN, *Domestic Arch.*, 4to., 1840. *Construction*, in *BUILDER Journal*, 1859, xvii, 86. LAROUSSE, *Dict. Univ. du XIX siècle*, 4to., Paris, 1875. THIERRY, *Escaliers en Pierre*, etc., 4to., 1844. RIDDELL, *Staircasing*, etc., 1860.

STAITH or staithe, or drop (Late Lat. *stallagium*). "Stathys, landing places by the side of a river", SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 449. It is said to be derived from the Anglo-Saxon for a shore or bank. In Cumberland it is applied to a depot for coals. NOTES AND QUERIES *Journal*, 4th Ser., viii, 395, 489; ix, 23, 100. A coal staithe at Middlesbrough-Tees is given in *CIVIL ENGINEER*, etc., *Journal*, 1848, xi, 105, from INST. OF CIVIL ENGINEERS, *Proceedings*.

STAKE. A small anvil, which stands upon a broad iron foot on the work-bench for removal; or else has a strong spike which is let into the bench so as not to be removed. Small cold work is set straight upon it, or else cut or punched with the cold chisel or punch. MOXON, *Mechanick Exercises* (Smithing), 4to., 1693, p. 21.

STAKE (Fr. *piquet*). A short length of wood, sharpened at one end for driving into the ground. "28 lots of black stakes", near Louth, 1868. PALISADE. STAB. DAM or weir.

STAKING OUT. The method of setting out the lines of a building on the site by means of stakes, is well explained in *BUILDER Journal*, 1843, i, 439.

STALK in Decoration. Part of the ornament in the Corinthian capital, similar to the stalk of a plant, from which spring the volutes and helices. It is either plain, or indented like fluting.

STALK. A steam-engine chimney. A factory chimney-shaft. The common height 1824 for a shaft for large steam-engines in Cornwall, was from 60 to 80 ft. The orifice was round, from 3 to 4 ft. diam. throughout. Great care is necessary in the foundations to insure an equally resisting bed upon which to build; it is well to bore so as to insure this condition. Concrete may aid in spreading the pressure of a lofty shaft over a large area; the pressure of wind, however, exercises so considerable a leverage as to cause many chimneys to lean or topple over. A gale strikes a shaft, causing one part of the foundation, the leeward side, to sustain a pressure considerably greater than the normal and vertical weight of the shaft. There is greater risk from a gale of wind when the mortar is not solidified. A stalk should have a regular batter; no stone should be used at the top where acids are emitted; and any overlapping should be formed by hard-burnt radiated fire-brick, 14 ins. by 5 ins. by 3 ins. In the North of England cavity chimneys are often built, in which the inner ring is carried up vertically of 4½ in. fire-brick for 20 or 30 ft., the main outer shaft closing with it as it diminishes or batters to the top. The outer shaft is often 14 ins. thick at the base. SCAFFOLD.

The London Official referees 1850 required for engine chimneys that the base of the footings should be one-half longer than the base of the shaft, and be placed as low as the base of the footings of any adjoining wall or building. If the shaft be square the height was not to exceed ten times the length of the side at the top of the footings; if circular, twelve times the lower diameter. The shaft was to diminish in size upwards and be at least one-third less at the top than at bottom. It was to be bonded every six courses with hoop-iron lapped at the edges. The projection at head of the chimney, if any, must not exceed three-fourths of the thickness of the work from which it projects; *BUILDER Journal*, 1850, viii, 561. LIGHTNING CONDUCTOR.

The Manchester free library was ventilated by gas-ventilating

chimneys and airways formed in the cornices round the room, communicating with down shafts having a common terminus at the base of a large ventilating chimney at one end of the building, used also by the boiler for its smoke and heated air; it is divided for several feet upwards with brick partitions so as to prevent any drawback as well as to direct upwards the vitiated air from all sources. The shaft gradually widening from base to summit quickens the draught; and this principle of gradually widening diameters is adopted throughout; *BUILDER Journal*, 1852, x, 579: which *Journal*, 1876, p. 323, refers to a discussion on this point, the editor stating that the present system of lessening the diameter is correct. The ordinary pressure of chimney-shafts on the foundations may be taken to be from five to ten tons per square foot (*INST. OF CIVIL ENGINEERS, Proceedings*, 8vo., 1850-51, x, 242).

Straightening and repairing. When a deflection takes place, the ordinary means of restoration to the vertical is to make saw cuts on the side of the shaft opposite to the inclination. Another and often more practicable plan in thick shafts is to remove a layer of bricks on the required side, replacing it by a thinner layer at different intervals in the height of shaft. Care should be taken, however, not to make the slits too wide, or an inclination is produced in an opposite direction to that intended to be rectified. Another plan has been to weight the foundation on the side opposite to the deflection. Mr. H. Smith has described 1882 a mode of repair. The foundations of a chimney were giving way; it was found to be built upon an arch, and the springers on one side were crumbling. To avoid the expense of taking down the chimney and rebuilding it, four foundations outside the base of the chimney were put in and iron pillars erected thereon. Then, by fixing a buttress against one side, a space for the insertion of an iron beam was cut out, the ends of which rested upon two of the pillars. The same process was repeated on the other side, and the two remaining sides were supported by transom beams resting upon the main beams. This done, the original arch upon which the chimney stood was removed, the whole weight being supported by the four iron pillars, leaving room for connecting the flues, with the advantage that the heat of the flues had no effect upon the foundations. *A new method*, in *BUILDING NEWS Journal*, 1870, xviii, 431-3, from the *ZEITSCHRIFT FÜR BAUWESEN*. Amongst the stalks repaired are mentioned:—At Thomes, *BUILDER Journal*, 1850, viii, 358; Friar's Goose Chemical works, 250 ft. high, *idem*, 1858, xvi, 595. *LEANING TOWER.* A list of fifteen stalks with details is given in *BUILDING NEWS Journal*, 1873, xxv, 551. Others, *idem*, 1865, xii, 592; 1870, xviii, 383-4; 1873, xxv, 605 and its fall; and one of rivetted iron 1870, xviii, 221.

A brick stalk 90 ft. high, 6 ft. 6 ins. diameter at the base, was moved by six men and two horses, 100 ft., at Salem, Massachusetts, before 31st July 1885. A cage was built around it for 23 ft. high, with shorter ones above. Holes were cut through and needles inserted, under these were put 34 screw-jacks which raised the whole sufficient to allow a rough platform to be constructed under them, and rollers to be set in place. The platform, which was of strong plank, extended to the new position of the chimney, and by levelling it carefully and employing a large number of rollers the load, weighing 130 tons, was easily moved into place.

BANCROFT, read at *CIVIL AND MECHANICAL ENGINEERS*, Nov. 1878; BANCROFT, *Practical Treatise on the Const. of tall Chimney Shafts*, fol., 1885; reviewed in *BRITISH ARCHITECT Journal*, 1885, xxiv, 76-7. RAWLINSON, *Designs for Factory Furnaces and tall Chimney Shafts*, fol., London, 1858. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, iii, 218-23, Scaffold by Journet; x, 242, weight of stalks on bases. KENT, *Sizes of Chimneys for Steam Boilers*, read at *AMERICAN SOCIETY OF MECHANICAL ENGINEERS*, 1884; reprinted in *CONTRACT Journal*, 1885, Jan., p. 77.

STALL (Lat. *forma*; It. *stallo*; Sp. *silla*; Fr. *forme*; *stalle*; Ger. *stühl*). CHANCEL BENCH. SEDILLA. THRONE. A fixed seat in a chancel, one of a number, generally elevated,

and usually finished with a rich lofty canopy of tabernacle work. Stalls are appropriated to the officials and dignitaries, and in a few cases to the knights of an order, as in S. George's chapel, Windsor. The dean's stall in a cathedral is generally on the south side of the choir facing east, S. Paul's, London, and Ely being exceptions. The precentor's stall is often in the middle of the length of north or south side at the back of the singers. Sometimes the stall on the north side corresponding to the dean's is reserved for the bishop during sermon time, as at Salisbury; or for the vice-dean, or for the archdeacon, or for a distinguished visitor. In collegiate churches, or those which were attached to, or were cells to, monasteries, or where there was a sufficient number of monks to join together at the canonical hours for the breviary services, the chancels were seated with stalls. The stalls at S. Quentin in France, probably reached from the choir transept into the nave; VIOLLET-LE-DUC, *Dict. Rais.*, i, 260. In the churches in Spain, the coro or choir is in the nave. DU CANGE, s.v. *forma* (and *stallum*), describes the word as "a seat of the singers in the choir, of two parts, one before and one behind; in the latter are folding seats which are turned up when the singers are obliged to stand." The backs are called *dorsalia* and *sella arcuata*; Fr. *dossier*; It. *postergal*; *spalliere*; the elbow, curved arms, or partitions (Fr. *musseau*; *accotoir*; *accoudoir*: the hinged seat, *misericordia*; Fr. *selette*; Eng. *miserere*. AMRO. STONE SEAT. 1. 2. 19. 23.

PASCAL, *Origines et Raisons de la Liturgie*; FARIN, *Hist. de Rouen*, 12mo., iii, 274. BERTY, *Dict. d'Arch. du Moyen Age*. DALY, *Revue Gén.*, xiv, 239. WEBB, *Cont. Ecclesiology*, 8vo., London, 1848, gives numerous instances of stalls, and of stalls behind altars, and returned.

Warwick; Beauchamp chapel; Contracts, BRITTON, *Arch. Ant.* Rodmersham church, Kent, perhaps the only ones in a chancel in England; *ARCHÆOLOGIA*, 1808, xi, 391.

Corbeil, S. Spire, a triple seat of wood; MILLIN, *Ant. Nat.*, temp. François I, whose device a salamander is in the gable of the middle one. London, Old S. Paul's. Elizabethan, CROWLE, PENNANT'S *London*, xi, 12, in British Museum.

Beverley and Southwell, of stone highly decorated.

Cartmell priory, Lancashire, temp. James I; seats are earlier.

Birtsmorton, Worcestershire; stall-like seats; of Elizabethan date.

Cotherstock, Northamptonshire; four seats; *ARCHÆOLOGIA*, xi, 393.

Gelnhausen and Friedburg, STATZ UND UNGEWITTER, *Gothic Model Book*, fol. (1860?); pl. 181-2, 183-4.

Churches of Bonn, Nuremberg, Brou, Dartmouth, Sefton, Montreal.

Nismes, S. Paul, by Questel, 1835; DALY, *Revue Gén.*, 1851, pl. 19, p. 219.

Ratzbourg, in Germany, Romanesque. Poitiers; xiii cent., rare.

Milan, San Vittore al Corpo; xvii cent., of walnut-tree wood.

Piacenza; duomo; stalls of rich semi-Gothic intarsatura. S. Sisto; very elaborate and good of their kind.

Modena; duomo, 1465, noticeable. Pisa; duomo; among the best specimens. Siena; duomo; begun 1387 by F. Toghli, completed by Bartolini and Benedetti, after the designs of B. Neroni (Riccio). Renaissance, *ARCHITECT Journal*, 1849, i, 326.

For most of the publications on "Stalls," reference may be made in this work to the cathedrals. *BRITISH ARCHITECT Journal*, 1886, for Aberdeen; 26 Dec. 1507, "Contract with John Ferdour, wright, to big, oupmak, and finally end and complet the xxxiiij stallis in thar queir—and pay tua hundrethe pundis vsuale money of Scotland"; SPALDING CLUB, *Burgh Records*, 4to., Aber., 1844-8, i, 77. GAILHABAUD, *L'Arch. du V^{me} Siècle*, iii, iv. NODIER, *Languedoc*, ii, pt. 1, for Comminges. ROUYER ET DARCEL, *Art. Arch. en France*, 4to., Paris, 1863-6, ii, 14, pl. 17, and pl. 25-6. *BUILDER Journal*, 1851, ix, 766. STATZ UND UNGEWITTER, *Gothic Model Book*, fol. (1860?), pl. 181-4. FREMERY, *Plans, etc., des plus belles Chaises de Cœur de Paris, abbaye S. Germain des Prés, faite par Mons. F.*, 6 pl., fol., Paris (1680?). *Illustrations*, Sculpture, iii, 1851-2, No. 124; and Bench end, i, 1856-7, pl. 27, No. 39.

STALL (Fr. *étal*; *stalle d'écurie*). The compartment which one horse occupies in a stable. The division between two compartments is called a "stall board," formed of strong boarding fixed to a ground sill and rounded top rail; or the lower part is

boarded and the upper part formed open of stout wood or iron railings. A stable for fifty horses had the divisions made of cast iron of a corrugated section, which has resisted the kicking propensities of some of the largest brewers' horses. In common stabling there is only a bail or hanging pole or travis, or board (Fr. *stalle volante*): this travis is generally placed between each pair of animals in a cow byre, the stall for which is 8 ft. square. DALY, *Revue Générale*, 4to., at Tattersall Beaujon, xx, 152-4; and at M. Dolfus, both at Paris, p. 156. SHAMBLE. SHEEPFOLD. LOOSE BOX. STABLE. BYRE. 1.

STALLAGIUM; see STAITH.

STALL BOARD. The division between the housing places in a stable. In Scotland called "travis, trevice, or trevice boarding", traverse in Northumberland. BULK.

STALLIUS (MARCUS); at Athens; see MENALIPPUS.

STALPERT (DANIEL); of Brabant, was employed 1648-55 with J. van Campen in erecting the town hall; also 1650 the asylum for widows (wederwenhof), both at Amsterdam; and became architect to the city. 24. 68.

STALL POST or hindpost of a stall; called "bosgin" in Lancashire.

STAMBH, stambha, tambh, Hind. for a PILLAR; FERGUSSON, *Indian Arch.*, 1876, p. 270; 276. KITTOE, *Illustr.*, fol., Calc., 1838, pl. 20.

STAMBOUL; see CONSTANTINOPLE.

STAMFORD STONE. This stone is obtained from the great and lower oolite, BARNACK RAG; Stamford marble, a very calcareous shelly stone with a crystalline paste, taking a good polish. CASTERTON STONE is somewhat similar; Clipsbam, Whittering Pendle, and Ketton, are all somewhat fine-grained and bright cream-coloured; Collyweston argillo-calcareous flag-stone is used locally for roofing in place of slates and tiles; BUILDER *Journal*, 1851, ix, 717. Stamford slate was used at Clare hall, Cambridge, 1635-89, "having the cleaveable nature of slate is used for the same purposes though at a considerable disadvantage both in the wear and weight"; J. J. SMITH, *Cambridge Portfolio*, 4to., London, 1840, p. 193.

STAMPED WORK; see PAPIER MACHÉ; PLASTER WORK.

STAMPALIA. The modern name of Astropalea or Astypalea, an island in the Turkish Archipelago. The town of the same name contains a large number of churches and chapels, sometimes as many as six in a row, built chiefly of materials from the ruins of ancient buildings which are also found in every part of the town. 28.

STANBROD; stanebrod; Slate pins, generally made of the leg-bones of sheep. STRABROD. SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 449.

STANCHE; an error for FRANCHE BOTRAS.

STANCHEON; STANCHION; stanchel; stauncheon (Fr. *estancion*). The term applied to any perpendicular prop or support, as a mullion; also the iron bar between them (also called *tirants*) which has frequently an ornamented top; GIDDE, *Book of Sundry Draughts*, etc., edit. by H. Shaw, 8vo., 1848, pl. 117. Also standert and standard, in SURTEES SOCIETY, *Fabric Rolls*, York, 8vo., Durh., 1859, p. 355. MOXON, *Mechanick Exercises*, 4to., 1694, Terms in Carpentry, refers stanchion to puncheon, which he describes as "a short piece of timber placed under some considerable weight to support it"; also BREES, *Illustrated Glossary*, 8vo., 1853. Hence to the timber stud, puncheon, standard, or quarter, of a partition. STANZONE.

Cast-iron + stanchions are recommended to be used in lieu of cast-iron columns from the certainty of the casting being equal; horizontal flanges dividing the height into three parts add much to the strength to resist deflection from the vertical. *Engineer's Pocket Book*, 1861, p. 155, gives the proportions, etc. PILLAR. GIRDER. Cast-iron columns are said to be nearly twice as strong as the same metal cast in the cross shape, but the latter are more easy to examine, etc.; BUILDING NEWS *Journal*, 1871, xxi, p. 6; which 1858, iv, 501-2, gives a good plate of details; and xviii, 307, a section of two \perp rivetted

together. FRIEDMANN, *Designs for Markets, Warehouses, Sheds, etc.*, transl. by AVIGDOR, 8vo., London, 1877, proposes to substitute wrought-iron shafts consisting of four vertical angle irons, with four connecting lattice webs to keep the angle irons at the required distance from the centre of gravity. A stanchion of steel built up, by Lindsay.

STANCLIFF QUARRY; see DARLEY DALE STONE.

STAND; see PATTEN; STADDEL; GRAND STAND. Also a solid body placed under an ornamental object to raise it, or to secure the glass which may cover it.

STANDARD. The upright pole of a scaffolding. In a framed partition, the STANCHEON, puncheon, stud, or quarter.

STANDARD. The upright end of a stall or bench, into which the back and seat are fixed. Usually called BENCH END. "Standard and standert", the upright iron bar in a window; see STANCHEON; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durh., 1859, p. 355 (STAYBAR, and TRANSSION). The side piece to the shelving above a dresser in a kitchen; when cut back as the shelving recedes it is called a "cut standard". A closet of wood with an opening in front. 1500, a large branch candlestick of laton. 19.

See PORTLAND CEMENT; MEASURE. Of deals; see HUNDRED and REDUCED DEALS. PIPE; see RAINWATER PIPE.

STANDARD (Fr. *gonfanon* and *enseigne*). In England, properly a long streamer tapering towards the end which is swallow-tailed; the cross of S. George next the shaft, with the owner's colours and his badges, crest and motto. The armorial coat was only on the "banner". PLANCHÉ, *The Conqueror and his Companions*, 8vo., 1874, i, 229. The Norman gonfanon was a small two or three-tailed flag attached to a lance; the Saxon ensign, a dragon; Harold's was an armed man. At the "Battle of the Standard", 1138, August 28, at Northallerton, was a mast on a car with three flags or streamers. FLAGSTAFF. A large flag bearing the whole of the achievements of the monarch or nobleman, as seen in the royal standard of England; when placed before the pavilion of the monarch, it was 11 yds. long and 3 yds. broad. The present "royal standard" is strictly a "banner". The length of the standard when borne in the field denoted the rank of the leader; that of a duke was 7 yds. long; that of a peer of lower degree was 5 yds.; that of a knight banneret was 4 yds. In funeral processions now, the standard is long and narrow and pointed at the end; that of a duke is about 15 ft. in length; peers of lower degree about 12 ft. The flag of foot soldiers is called "colours", but it is strictly a "banner"; that of a regiment of cavalry is a "standard". In XIII cent. the "flag" was an upright oblong; in XIV cent., perfectly square. *The Union Flag*, in BRAYLEY, *Graphic Illustrator*, 4to., 1834, pp. 65-70.

The standard given to S. Martin's church, Westminster, by the Lords of the Admiralty, 1726, was 30 ft. long and 14 ft. broad. The Blenheim banner presented annually as a "ground-rent" is 18 ins. square; the stick 3 ft. 6 ins. long. The Waterloo banner is 27 ins. square, length of stick 4 ft. 4 ins. The gold fringe of 2½ ins. depth is additional. The banner made for the castle at Florence at the visit of emperor Charles V, was a standard of crimson cloth 18 braccia by 40 in length, decorated with a bordering in gold entirely round it, exhibiting the devices of the emperor and of the house of Medici; in the centre were painted the arms of his majesty; 45,000 leaves of gold were used: it was designed by G. Vasari, assisted by Andrea di Cosimo, and Mariotto di Francesco, *metter d'oro*; VASARI, *Lives*, edit. 1851, 8vo., iii, 351. It. *stendardo* in MORONI, *Dic.*

STANDELF. A corruption of "stone delf", an old Shropshire term for a stone quarry; OWEN AND BLAKEWAY, *Shrewsbury*, 4to., 1825, ii, 462. 19.

STANDER; see SRAM in plumbing.

STANDING STONE or pillar; see MAENHIR. Also called pulvan; a long or upright stone, and pillar stone. CARNAC.

STAND-PIPE in waterworks. A tube 8 ft. diam., 204 ft. high, holding 75,000 gallons, of plate iron $\frac{3}{8}$ to $\frac{1}{2}$ thick, en-

closed in a handsome brick and stone tower, at Bloomington, Illinois, is given in THE PRACTICAL MAGAZINE for January 1876, p. 3-4. West Philadelphia Waterworks; CIVIL ENGINEER, ETC., *Journal*, 1854, xvii, 337.

STANHOPE (Charles, lord viscount Mahon, afterwards lord). invented a fireproof "composition for flat roofs". It was used about 1797 to the stables at Broomfield lodge, Clapham, Surrey; as stated in RICHARDSON, *New Vit. Britt.*, fol., 1802, i, pl. 17-18; 1807 at lord Palmerston's; 1810 at lord Berwick's; 1812 sir James Langham; 1816 and 1823 the pavilion at Brighton; and by J. Nash 1826 and 1829 at Buckingham palace, and at his own house in Regent street, and at East Cowes; INSTITUTION OF CIVIL ENGINEERS, 1843, ii, 90-4; CIVIL ENGINEER, ETC., *Journal*, vi, 210; SURVEYOR, ETC., *Journal*, iv, 225; and BUILDER *Journal*, i, 289. The weight of two coats each $\frac{1}{4}$ th thick including slate is reckoned about 12 lb. per foot super.

The following receipt for the composition and workmanship is condensed from the MS. of a trustworthy source. The roof is to be nearly flat, say 1 in. in 10 ft. fall. The due proportion of the materials as well as the order of mixing them should be strictly observed, as much difference in the result occurs. 1. Three parts by measure of pounded chalk placed in a wood box. 2. Add by degrees one measure of clean vegetable tar (best Swedish), mixing them well together with a wooden shovel, until a uniform colour is obtained throughout; this is called "unboiled chalk tar without sand". Put the whole of it into an iron vessel or pot, to be heated in the same manner as is a copper; but so arranged as to have hot-air flues in order not to burn or injure the composition; stirring it up occasionally from the bottom to prevent injury. When thus heated, a clean lath should be dipped into it and then plunged repeatedly into cold water; when the composition has lost its heat and feels quite cold, it should be pressed with the end of the finger, and if it resists it, but is still soft enough not to resist the pressure of the thumb-nail, it is then right and the following is to be added while hot. 3. Sand, well washed and then well dried, four measures, and made quite hot over an iron plate so that it is too hot to be stirred by the hand. Add this by slow degrees and incorporate it, thoroughly stirring it up from the bottom. This mixture is then ready for use, and is to be carried direct to the roof in a thin iron kettle and spread on whilst hot in an even thickness of about one quarter of an inch, with hot trowels; a second coat of like thickness to be laid on a subsequent day. If it be intended to be covered with slate over all, then the second coat (or bedding coat) should be about $\frac{3}{4}$ in. thick, in order that the slates shall be well bedded whilst the composition is hot.

This roof is neat, flexible like thick shoe-leather, not injured by heat or cold, not damaged by high winds; and if attentively done is impenetrable to water. It should not be laid on boards but on laths made from inch deal boards (if the joists are more than 8 ins. apart) cut into three breadths, between 2 and 3 ins. wide. Their lower corners next the joists should be planed off for about one-eighth of an inch or more. In nailing down the laths the nail should be driven inclined towards the first lath to bring the joints quite close. The top and bottom may be rough but the edges straight and clean, and should range well in widths. The chalk should be first sifted through a sieve of eighteen meshes to the inch; then through one of twenty-four; the sand sifted through one of eight; the remainder rejected; the sharper the sand the better, but round grain need not be rejected provided it is not sea sand. It is then again sifted through a sieve of sixteen meshes, and what remains in the sieve is called "coarse sand"; the sand which passed through the sixteen-mesh sieve is again sifted through one of thirty-two, and all that does not pass through that sieve is preserved and is called "fine sand", and that which does pass through is called "fine rejected". Take of the "coarse sand" five parts by measure and of the "fine sand" two parts and mix them extremely well together. This is the sort of sand of which four measures are to be put into the boiled "chalk tar" as aforesaid.

The earl's method of securing buildings from fire, principally by "underflooring" and "double underflooring", is described by himself in ROYAL SOCIETY, *Phil. Trans.*, July 2, 1778, lxviii, pt. 2, p. 884; and BUILDER *Journal*, 1850, viii, 292. INCOMBUSTIBLE; PUGGING. It is said that in 1777 at the family seat of Chevening he set fire to a room upon the basement story, while lord Chatham and a large party were eating ices in a room over secured by an air-tight composition laid over the floor; H. SMITH, *The Moneyed Man*, 8vo., 1841, ch. 7. ARCHITECT, *Fires Prevented*, 8vo, 1793, p. 36; 67.

STANKO (JOHANN), 1407 erected the church at Böhmisch-Crumau or Krummnu; the contract "still exists", 1847. He was paid 310 Bohemian groschen. HERRMANN, *Chronica Rosenbergica*, p. 70. 26. 68.

STANZIONE (cav. MASSIMO), chiefly a painter, of Naples, born 1585, died 1656; DOMENICI, *Vite-dei Napoletani*, 8vo., 1844, iii, 176-215. 68.

STANZONE; stauneyon, stauncon, 1433. A kind of board; or piece of timber; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Dur., 1859. STANCHEON.

STAPELFORD (THOMAS DE), 1349-56, 28 to 29 or 30 Edward III, perhaps only clerk of accounts at the palace at Westminster, succeeding R. de Campsale, and succeeded by W. de Lambheth (1338-9); it would seem he paid monies in twelfth year to Walter de Weston who was then "clericus opac." at the palace. BRAYLEY AND BRITTON, *Palace, etc.*, 8vo., 1836, p. 149, 162.

STAPLE (Fr. *gache*; Sp. *argolla*; *agujero*). "Stapyls; eyes for hooks of iron", SURTEES SOCIETY, *Pinchale Priory*, 8vo., Newcastle, 1837. The piece of iron formed into the shape] and driven into the frame of a door, used formerly to catch the bolt or hasp of a lock. A "box" is now commonly used. SLOT. 1. 5. 16.

STAPLE or estaple (Fr. *estape*, mart or market; Ger. *stapelen*). An old term for a wholesale market, or market place; established 27 Edward III. 14. 19.

STAPLETON STONE. A magnesian limestone, from a quarry in Yorkshire either in North Riding, near Richmond; or in West Riding, near Pontefract; there is nothing to show, but probably the last named. 1367-8 for thirteen tons of Stapleton freestone at 8s. per ton, used at Rochester castle; ARCHÆOLOGIA CANTIANA, 1859, ii, 112. It was used at Westminster abbey. Stapilton of the *York Fabric Rolls*; on 17th July 1400 king Henry IV allowed the chapter to carry stone from it to York toll free. 1417, 5th Henry V, safe conduct to three masters of vessels proceeding to "Stapleton, Cawode, and Dancastre" for stone, etc., for Syon; RYMER, *Federa*, Synopsis, xvii, 180. Jan. 5, 1428 for Grocers' hall; in windows, jambs, sills, crestable, ashlar, coyne, skew ragge, etc., 32l. 2s. 11d. 1441 "Stapulton" stone at Eton college; it cost at the quarry 1s. per ton; to the Humber by land 1s.; down the river and by sea to London, 4s.; up the Thames 1s. 4d.; total 7s. 4d. per ton; TIGHE AND DAVIS, *Annals of Windsor*, 8vo., 1858, i, 336. There is a quarry of the same name near Bristol; PENNANT STONE.

STAPULATIONEM; see SCAPULATIONEM.

STAPYLTON (THOS.), 1429 was master of the lodge of masons at Canterbury, under archbishop Chichele; John Morris, custos or warden, fifteen fellowcrafts and three apprentices, all named in MS. *Register* of William Molart (or Molash), Lib. Gen. Dom. Gugliel. Prioris Eccles. Christ. Cant. erga festum, N. D. 1429, p. 88; PRESTON, *Illustrations*, 1775, p. 215; edit. 1788, p. 197; and 1812, p. 163; ANDERSON, *Constitutions*, edit. 1738.

STAR. An ornament, usually four-pointed, often used in Norman architecture. It has been called "Asteric molding".

STARCH or STONE BLUE. A powder blue, is smalt. COBALT.

STAR HOLE. At Gloucester cathedral; in vaulting of tower for letting bells through up or down; FOSEBROKE, *Gloucester*, fol., Lond., 1819, ii, 1298. HOLE. SEPULCHRAL LIGHT.

STARKE (JOHANN GEORG), designed 1678 the palace of the elector of Saxony in the great garden; in the French style and then much admired. He was appointed oberland baumeister. 68.

STARKE (WILLIAM). A native of Dunfermline, in which town the old tower, 80 ft. high, fell 19 Aug. 1807, soon after which the heritors rebuilt it from his design. He resided at Glasgow, where he fitted up the choir, known as the inner high church, of the cathedral, and put up a gallery therein now cleared away; he designed 1804-5 the third court or Hunterian museum of the former university, costing £10,000, now destroyed; 3 June 1807 S. George's church; published *Remarks on the Construction of Public Hospitals for the Cure of Mental Derangement*, 4to., Edinb., 1807—and thereon designed 1809-10, the lunatic asylum (now the workhouse) at Glasgow, considered in 1817 as the best in Britain at the time of its erection—it was on the radiating principle; (while his other hospital 1820 at Dundee was of the H-form, for 208 patients); and 18 Sept. 1810 the gaol and public offices or judiciary courts, £28,000; (remodelled, etc., 1845 and 1859 by Clarke and Bell). At Edinburgh the beautiful interior of the two lower libraries of the writers of the signet and the advocates are attributed to him; ANDERSON, *History*, 8vo., Edin., 1856, p. 596. The lunatic asylum at Gloucester, by Collingwood, was erected 1822-3 after plans by Starke. He went to Edinburgh for his health; and 10 Sept. 1813 died at Drumsheugh, near that city; SCOT'S MAGAZINE. *Reports on Lunatic Asylums*, 1819. A letter is given in *Memorials of his Times by Lord Cochrane*, from sir Walter Scott, describing Starke as the best modern architect that Scotland had produced. CLELLAND, *Annals of Glasgow*. W. H. Playfair was a pupil.

STARLING or sterling (Fr. *brise-glacé*; *avant-bec*; It. *punta*). Large piles placed on the outside of the foundations of a pier of a bridge to break the force of the water. An enclosure consisting of piles driven close together in the bed of a river to receive a pier, and secured by horizontal pieces at the top. The void, upon being filled with chalk, gravel, or stone, forms a protection to the foundation. It is often more sharply pointed on the upper side than on the lower side, for the purpose of dividing the stream, and cutting floating ice in severe frosts, and is thence called a "cutwater". A "dolphin" is formed by the piles driven a small distance apart to protect the bridge pier from damage by vessels striking it. PIER. STILL. 1. 5. 23.

STAROV or Staroff (IVAN GREGOROVITSCH), a pupil of Kakorinov, was private architect to the empress Catherine II of Russia (1762-96), for whom at S. Petersburg he designed 1776-90 the new pantheon or cathedral church of the monastery of S. Alexander Nevsky (SVININ, *St. Peters.*, 4to., 1816-8, ii, 5; GRANVILLE, *Guide to St. Pet.*, 8vo., 1835, ii, 189); 1780-3 the magnificent Taurida palace presented by her to Potemkin; 1780 *cir.* also for her, the rich church or cathedral of Sta. Sophia, near Zarscoselo, near the city, in imitation of the mosque at Constantinople; was 1784 a member of the committee for building the catholic cathedral church at S. Petersburg; 1786 the marble gallery containing the hall of S. George and the throne-room; 1794 the superb throne in the former, his masterpiece (BRITISH ARCHITECT *Journal*, 1885, Aug., p. 98); the Strelna palace, perhaps restored 1800-4 by him under Rousco or Rusca (SVININ, ii, 87; iii, 55); the two country houses for the Demidov family; and many private houses. He was assistant and 1794 rector of the academy, and knight of the order of S. Vladimir of the third class. He died in or about 1796.

It was probably his son who 1827 carried out the design by Quarenghi for the triumphal arch at the Riga gate, at S. Petersburg (described in GRANVILLE, *St. Peters.*, 1835, ii, 144); and 1838-9 with Bruilov, the winter palace after the fire of 29 Dec. 1837. Also attributed to STASSOV, if not the same person. 68.

STAR-SHAPE. Buildings have been designed on this plan of six points; as the schloss Stern, near Prag. The ancient temple at Buchropully, in the Chalukyan style, is polygonal or star-shaped, with an open pillared porch; the roof is in steps, surmounted by a flower or vase. At Somnathpûr in Mysore, the steps are richly carved. At Hullabid is another, and also a double temple, now only 25 ft. high, the pyramidal spires not

having been erected; FERGUSSON, *Indian Arch.*, 1876, p. 389; 399-400. The plan of Sterborough castle, near Lingfield, Surrey, still to be traced within the moat, is in the form of a star, alluding to the estoile of the coat armour of the Cobham family whose residence it was. STELLAR VAULTING, see GROINED VAULTING; and GROIN RIB.

STASSINS (JAN), born about 1440; designed at Gand 1461-1534 the tower 268 ft. high to the church of S. Jan now of S. Bavon; its timber spire was burnt 1603; he probably only completed it; REVUE DE BRUXELLES, 8vo., 1837, p. 8; STAPPAERTS, *La Belgique Mont.*, 8vo., 1844, i, 52-4; 111. At the hôtel de ville, the salle des échevins (*la Keure*) dates 4 July 1481-3. In 1516 "Jaen Taesens or Stassins" built the salle du tribunal (*vierschare*) and the part of the façade in the marché au beurre. Dying 1527, his successor Juste Pollet, or Eustache Polleyt, pulled down great part of Stassins' work, and rebuilt it as now seen; SCHAYES, *Hist. de l'Arch.*, 8vo., Brux. (1850-3), iv, 44. VOISIN, *Guide*, 1831; 1837; (1843). In 1525 Stassins was instructed to design a new hôtel de ville at Oudenaarden, but dying in 1527, H. van Pede was consulted.

STASSOV (...), studied at the royal academy at S. Petersburg, went to France and Italy; designed 1818 the triumphal arch of iron at Zarscoselo (SVININ, *S. Peters.*, 4to., 1817, iii, 181); with many other works at S. Petersburg and at Moscow (*idem*, ii, 89); also the "casernes" on the road to Pawlowsk; and 1831-3, the Narvsky gate or triumphal arch, with Quarenghi, first of timber and then of iron by Clarke and Pratt, engineers. Under STRASSOV he is said to have rebuilt 1838-9 with Bruilov the winter palace; see STAROV. 68.

STAT DE CHARGE, or tas de charge; see SPRINGING.

STATE HOUSE. The building erected for the administration of the affairs of one of the United States of North America; it contains the rooms for the auditor, treasurer, and other officers, record-rooms, etc. On the upper floors are the halls for the senate and house of representatives, a library, court-room, committee-rooms, etc. The plans, etc., of several are given in a volume of *Specifications, etc.*, pl., 3 vols., fol.; text 8vo., Wash., 1856-7, in the library of the Royal Institute of British Architects. CAPITOL. Columbus, Ohio; by W. Russell West; *BUILDER Journal*, 1852, x, 658-9. Albany, New York state capitol, by Fuller and Laver; *idem*, 1870, xviii, 6; later by Fuller, Eidlitz, and Richardson; ROY. INST. BRIT. ARCHITECTS, *Proceedings*, 1885-6, p. 187.

STATIONARUS (AURELIANUS), probably an architect at Regensburg during the Roman period. His name was found 1809 on a stone during the demolition of the church of S. Peter there, and deposited in the museum at Munich. 68.

STATICS. The science of weight, especially when considered in a state of equilibrium. It is considered with "mechanics", which is the science of forces, and the effects they produce when applied to machines in the motion of bodies. EARNSHAW, *Statics, including the Theory of the Equilibrium of Forces*, 3rd edit., 8vo., 1845. DU BOIS, *Elements of Graphical Statics, and their application to Framed Structures*, 8vo., New York, 1877. GRAHAM, *Graphic and Analytic Statics in Theory and Comparison*, 8vo., 1883. 1.

STATIKRATES. The name given by PLINY and by PLUTARCH to the architect who built Alexandria; he is also called Demochares, Cherokrates, Deinokrates, Tymochares, Timocrates; properly DINOCRATES, as by VITRUVIUS. 68.

STATIO. The Latin name for a fort, or castle, or citadel. The term as used by VITRUVIUS, 1, ii, seems to mean anything dictated or laid down by authority, whether by religious doctrine or the conventionalities of society, as explained *s. v.* Decor.

STATION. 1. A place of assembly used by the primitive Christians on Sunday, Wednesday, and Friday. 2. The stages of the Passion of Our Lord, often placed round the nave of a large church, and in cloisters, by painting, sculpture, and embroidery. Bas-reliefs outside the choir, etc., at Stendal, in

Prussia. The XII stations of the cross, in the Aukirche, at Munich; at Silz, near Innsbruck, the wall of the churchyard has small shrines at short intervals in each of which is a station; at Fried, along the outer wall are alcoves in which the stations are placed; WEBB, *Cont. Ecclesiology*, 8vo., London, 1848. At Nuremberg, along the road to the cemetery, nearly the size of life by A. Kraft; at the summit of this *creutz-gang* is a great calvary, etc.; PUGIN, *Glossary*, 4to., 1846, p. 216. On the ascent to a shrine or sanctuary on a hill top, as at Notre Dame de Fourvières, at Lyon. In the Roman Catholic enclosed garden at Gethsemane. 3. The halting-places of solemn religious processions, as on the Rogation days, Corpus Christi, the reception of a legate, of a bishop, or the dedication feast of a church; LEE, *Glossary*, 4to., 1877. SHIPLEY, *Glossary*, 8vo., 1872. PROCESSIONAL PATH.

The ancient Mexicans had in Peru small buildings used by the messengers who forwarded the messages of the Inca through all parts of the country; some are still in a fair state of preservation, and are often mistaken for the forts or grain magazines. These "stations" are erected on little hillocks, and at such distances apart that they could be seen from one another, which enabled great despatch; TSCHUDI, *Travels in Peru*, transl. by Ross, 8vo., London, 1847, p. 324.

STATION LINE; see LINE OF STATION.

STATION; RAILWAY. In addition to the publications named s. v. RAILWAY may be added:—VILLEVERT, *Const. des Travaux d'Art*, 36 pl., 4to., Paris, 1866. BOUCH AND HORRICK, *Working Drawings of Rail. St., of the Eden Valley Rail.*, 44 pl. NEURENTH, *Bahnhoff, etc., in Bayern*, 7 pl., fol., 1860. *Die Badische Eisenbahn Sammlung von constr.*, 45 pl., fol., Carls., 1853. *Die Eisenbahnbauten bei Kehl, etc.*, 30 pl., Carls., 1860. RONDELET, *L'Art de Bâtir*, supp. by BLOUET, pl. 15-6, fol., Paris, 1858. NOUVELLES ANNALES DE CONSTRUCTION, fol., Paris, 1851-4, i, 19-20, Wayside; 27; iii, 13-4, gard du Nord; 25-6. ALLGEMEINE BAUZEITUNG, 1842, at Vienna, pl. 401-17. ILLUSTRATED LONDON NEWS *Journal*, vi, 381; vii, 73, 76 240; Tamworth, xi, 368. *Papers of CORPS OF ROYAL ENGINEERS*, vii, 220, roof of Bricklayers' Arms station. HOOD, *Railway Stations*, read at Inst. of Civil Engineers, 20 April 1858, alludes to the want of special information on the subject. BUILDER and BUILDING NEWS *Journals*, passim.

STATIONES of the Gymnasium, the places for seats. 1.

STATUARY. A term formerly applied to an artist working in bronze; later called SCULPTOR, who usually works in stone, marble, or plaster. CARVER. LAPIDARY. MASON. MODELLER.

STATUARY BISCUIT; see PARIAN.

STATUARY COLUMN. A term used 1700 *cir.* for a column on which a statue is placed. 4.

STATUARY MARBLE. A WHITE MARBLE used by sculptors, and carvers of tombstones.

STATUE. An image, made of stone, marble, metal, wood, etc., to decorate a building, open place, gardens; the richest are of cast brass or bronze, sometimes gilt; marble; others of stone, stucco, terra-cotta, plaster, wood, and lead sometimes gilt. BRONZE; cadaver; CARIATIDES; COLOSSUS; corpse tomb; EFFIGY; emaciated; figure; IMAGE; MONOLITHIC; MOVING; OPTICAL CORRECTIONS; PERSIANS; portrait; SEPULCHRAL MEMORIAL; SKELETON; TERMINAL; TOMB.

Owing to the comparatively low temperature at which lead melts, and the ease with which it can be cast into the most intricate forms, the system of casting groups of statuary and other designs from wax originals was in use during the finest periods of Italian and Greek art. The wax when coated with plaster-of-Paris may be melted out, leaving a perfect mould. "Under-cutting" may thus be easily carried out. Five per cent. of antimony gives hardness to the material and increases the sharpness of the cast. The equestrian statue erected about 1686 of king Charles II, in Parliament square, Edinburgh, is a fine instance of lead statuary.

The Sacred way from the port to the temple of Apollo at

Diduma or Branchida, near Miletus, had a row of statues on each side; in 1858, two of them, with a lion, and a sphinx, were brought to London by C. T. Newton, and are now in the British museum; the statues are the earliest known works of Greek artists. *Course of Attitudes of Figures on Tombs*, by SCOTT and RUSKIN, in BRITISH ARCHITECT, 1881, Aug. VIOLLET-LE-DUC, *Dict., s. v. Sculpture. Return of Public Statues*, 1868.

Colour to Statues; see POLYCHROMY. STAINING MARBLE. BURGESS, *Notes of Coloured Marble Statues* in the Museo Borbonico, at Naples, in BUILDER *Journal*, 1862, xx, 459. BELL, *Colour on Statues, etc.*, read at SOCIETY OF ARTS, BUILDER *Journal*, 1861, xix, 286; 395. WESTMACOTT, *On Colouring Statues*, in ARCHÆOLOGICAL *Journal*, 8vo., 1855, xii, 22-46. 1. 4. 25.

STATUMEN; Statuminatio. The term used by VITRUVIUS for that which supports anything, as a prop, buttress, etc. It is given to the lowest layer, composed of stones mixed with cement, in making a road.

STATZ and Stadtz (VINCENT), a master-builder and architect of Cologne; was employed under ... Zwirner for some time in executing the practical details of the works at Cologne cathedral. He built sixty Gothic churches in fifteen years (BUILDER *Journal*, 1859, xvii, 251), among which are S. Mauritius, 1859 the finest modern church (Gothic) in Germany; BUILDER *Journal*, 1867, xxv, 803: which p. 802 gives a plan of his cathedral of S. Mary at Lintz, on the Danube, begun 1862; lady chapel opened 1866: church at Euphen; at Käylear near Cleves, Höchensenn; and several near Cologne, as at village of Nippes. 1856 he obtained the third gold medal in the competition for the church of Notre Dame de la Treille at Lille. He published *Mittelalterliche Bauwerke nach Merian*, 8vo., Leip., 1856. *Kirchliche Bauwerke in Goth. style*, fol., Lutt. (1857). *Recueil d'Eglises, etc., dans le Style Gothique*, fol., 66 pl., Liège, 1858, etc. *Gothisches Musterbuch*, with UNGEWITTER and REICHENSBERGER, fol., Leip., 1856-61; and transl. by MONICKE, *Gothic Model Book*, fol., London (1858). *Gothische Entwürfe*, 4to., Bonn, 1861 (-54).

STAUROPOLIS; see APHRODISIAS.

STAVE, from STAFF. A piece of wood chiefly wainscot of which barrels are made. CLAPBOARD. Deal staves were (June 1868) sent from Norway and sold for 25s. per 1,200, i.e., 1s. 4d. each including everything. Also a small cylinder forming one of the bars to a hayrack in a stall.

STAVERTON (WILLIAM DE), 1307, clerk and comptroller of the works at the palace of Westminster, tower of London, and the king's mews, 1 Edward II, account from Aug. 7 to March 10 following; and another 7 Aug. to 24 Feb.; BRATLEY AND BRITTON, *Palace*, 8vo., London, 1836, p. 108, 110.

STAY. Any piece of wood or iron placed so as to steady a work. An old term for an angle support in a roof, as in MUEY, *Manière de bien Bâtir, etc.*, transl. by PRICKE, fol., 1670, pl. 47. STRUT. A bar arranged to keep open a casement or light on pivots. Tonks and Sons' patent wedge casement stay is simple in construction. The metal right angle bracket having greater height in proportion to its projection, for supporting a shelf. CORBEL. SHORE.

STAY BAR; formerly called "tiraunt". The iron bar passing along the top of the mullions of a window; the smaller ones were called "transoms" now "saddle bars"; ECCLESIOLOGIST *Journal*, 1846, v, 170. STANDARD. 16. 17.

STAYER for STAIR, occurs 1540 in CAMDEN SOCIETY, *Ludlow Accounts*, 4to., 1867, p. 5, etc. STEE.

STAYKFALE HOLE, as used 1488-9. Supposed to be what is now called a PUTLOG HOLE in scaffolding; SURTEES SOCIETY, *Priory of Finchale*, 8vo., Newc., 1837, p. 383. 17.

STEADING and farm steading. A northern term for the buildings comprising a FARM. In Dumbartonshire it is given to the farm-house and offices, costing in 1800 about £160 sterling (iii, 341); also "each steading of buildings" (iv, 400); in FORSYTH, *Beauties of Scotland*, 8vo., Edinb., 1808. HOMESTEAD. FARM BUILDINGS. A "model farm steading" at Wark, Northumberland, designed by J. Bulman, is described in Catalogue of

Exhibition of Industry 1851; and in *BUILDER Journal*, ix, 1851, p. 555.

STEAM. The vapour of hot water. Its mean temperature in the open air at the boiling point is 212° Fahr., 100° on the centigrade, 80° Reaumur, and 673.2° on the absolute scale. A cubic foot at 212° weighs 257.218 grains. It gives 14.7 lb. pressure. Superheated steam is that which has a temperature higher than that of saturation at the same pressure. A cubic inch of water makes about a cubic foot of dry steam. **AN ENGINEER, The Safe Use of Steam: Rules for the Guidance of Unprofessional Steam Users**, 4th edit, 8vo. **VIOLETTE, On the Carbonization of Wood by Steam, and on some other important practical Applications of the Heating Power of Steam**, with remarks by PORTLOCK, in PAPERS OF CORPS OF ROYAL ENGINEERS, 8vo., New Series, i, 1851, 203; and *CIVIL ENGINEER Journal*, 1848, xi, 320. **DENSITY. Detached Essay, HEAT. IGNITION. SPONTANEOUS COMBUSTION. SEASONING OF timber. RADIATION.**

STEAR (J.); see STEERE (J.).

STEATITE. A hydrated silicate of magnesia, combined with a little alumina and oxide of iron. Its peculiar greasy feel has caused it to be named SOAPSTONE. It is much more abundant and more extensively used in America than in England; and being almost as readily worked as the soft woods, and with similar tools, it is applied to many purposes for which its superior durability renders it preferable, as baths and the jambs of fire-places; and it is used in Switzerland for stoves of superior quality. Large beds of the pure material are found in Canada. It is so soft that it can be turned in a lathe, cut with a chisel, planed, bored, or sawed. It resists pressure especially when having in it hornblende or serpentine. It takes a good polish; if heated it does not flake. **CIVIL ENGINEER, ETC., Journal**, 1854, xvii, 317; *BUILDER Journal*, 1854, xii, 521.

STEE or STEY. A Scotch and Yorkshire term for a LADDER. In CHAUCER, "stairs" is written "steyers". **STAYER.**

STEEL. Named early in XIII cent. by Robert of Gloucester; also by CHAUCER in the first and second stories, *cir.* 1400; and "caleps or calebs, stele; fierum, yryn", XV cent., in WRIGHT, *Vocabularies*. The hardest of the metals and the strongest of known substances. It is a malleable compound of iron with from 0.5 to 1.5 per cent. of its weight of carbon. These, according to most authorities, are the only essential constituents of steel. It may be hardened and tempered. **MOXON, Mechanick Exercises**, 4to., London, 1677; 1693, p. 54, describes English, Flemish, Swedish or Dantzic, Spanish, Venetian, and Damascus—steel, but does not appear to explain the manufacture. **IRON.**

MALLEABLE IRON. 14.
Iron not being sufficiently hard for some purposes, is converted into steel; it is made by various processes which of late have become numerous. They may all be classed under two heads: 1, adding carbon to malleable iron; 2, abstracting carbon from cast iron. The former is used for cutting tools and other fine purposes; the latter in making great masses of steel and steely iron rapidly. *Blister steel* is made by cementation, which consists in imbedding bars of the purest wrought iron in a layer of charcoal and subjecting them for several days to a high temperature. *Shear steel* is made by breaking bars of blister steel into lengths, making them into bundles or fagots, and rolling them out at a welding heat. *Cast steel* is made by melting bars of blister steel in a crucible, along with a small additional quantity of carbon and some manganese. It is the purest, most uniform, and strongest steel and used for finest cutting implements. Another process, requiring a higher temperature, is to melt bars of the purest malleable iron with manganese and with the whole quantity of carbon required in order to form steel. A sort of semi-steel or steely iron made by this process and containing only a small proportion of carbon, is known as *homogeneous metal*. *Bessemer's process* 1858 is to make steel by the air-blast from molten pig-iron, either by blowing jets of air through the iron and stopped at an instant determined by experience; or, the blast is continued until the carbon is all removed, so

that the vessel is full of pure malleable iron in the melted state, and then carbon is added in the proper proportion, along with manganese and silicon. The steel thus produced is run into large ingots, which are hammered and rolled like blooms of wrought iron. Blocks of steel of 57, 100, and 250 tons were cast in 1865. *Puddled steel* is made by puddling pig-iron and stopping the process at the instant when the proper quantity of carbon remains: the bloom is shingled and rolled like bar iron. There are also some other processes.

The "Simonds process" for forging steel articles in one heating instead of in several heatings is of great importance, being as great an advance in the forging of circular articles—such as shot, shell, balls, spindles, etc.—as the Bessemer process was in the manufacture of steel. The economy resulting therefrom is not only large but the process is greatly superior in efficiency to the existing methods of manufacture.

The relative strength of Cast steel, Shear steel, and Blister steel, to resist torsion, lead being 1, is 19.5, 17, and 16.6 respectively, while English iron is 10.1 and Swedish iron 9.5. **HOMOGENEOUS METAL. SHEAR STEEL. PUDDLED IRON.**

Indian steel is a peculiar description manufactured in India under the name of *wootz*. **URE, Dict. of Arts**, 1846; **HOOKE, Journals**, ii, 310; **PERCY, Metallurgy**, 8vo., 1864, p. 775-6. It has a peculiar effect called "damascening" when treated with dilute sulphuric acid, from the layers of iron and steel in its composition. *Damascus steel* is made directly from the ore, or by welding steel rods and iron rods together. *German steel* is made from pig-iron, by depriving the latter of a portion of its carbon and impurities. *Blister steel* appears to be the most advantageous, so far as quality is concerned.

The trade is now sufficiently advanced to produce suitable steel for every individual purpose of construction; the Bessemer metal may be employed as the one thing needful for plates, angle bars, and all other purposes requiring metal of great toughness and perfect uniformity, for as regards iron there is no great uniformity of quality (**MUSKET**). The manufacture of steel rails, steel girders, steel boiler-plates, etc., is mainly due to this important process of Bessemer's, one which may tend to do away with all mere *cast or wrought iron* in building constructions. Rolled iron and steel joists from $\frac{3}{4}$ to 20 in. deep, some 70 ft. long. *Flitches*, 6 in. to 30 in. wide, to 40 ft. long. *Plates*, $\frac{3}{8}$ and upwards to 10 ft. wide, to 45 ft. long. *Moreland's mild steel* for constructional purposes, more rigid; and the floor girders can be made of decreased depth if required. Perkins's steel bath 1886 combines lightness with strength. Lindsay of Paddington has steel stanchions, built up; also a steel decking floor, corrugated. Cast steel bells 1855, by Naylor, Vickers, and Co., Sheffield; *BUILDER Journal*, 1859, p. 832 dup.; *BUILDING NEWS Journal*, 1860, vi, 620; and *ILLUSTRATED LONDON NEWS*, previous. For cutters, punches, taps, and dies, tools, piston rods, pins, axles, shafts, etc., 1864. Cast steel for knives, razors, chisels, and other small work requiring a good polish. Lones's patent steel-coated iron, said to be an excellent substitute for steel, and is 25 to 50 per cent. cheaper. Hookham's patent steel ribbon sash line 1874, formed of several bands of watch-spring steel covered with a binding of copper wire. No. 1 for sashes up to 40 lb., breaking strain 3 cwt.; up to 100 lb., $4\frac{1}{2}$ cwt.; heavier sashes, 7 cwt.

STYFFE, Iron and Steel: their elasticity, etc., transl. by SANDBERG, with pref. by PERCY, 8vo., 1869. **PERCY, Metallurgy**, 8vo., 1864. **EDE, Management of Steel, Tempering, etc.**, 8vo., 3rd edit., 1866. **OVERMAN, Manufacture of Steel, etc.**, 12mo., New York, 1853. **KIRKALDY, Experimental Enquiry into the Comparative Tensile Strength, etc., of Wrought Iron and Steel**, 8vo., 1862. **MUSKET, Papers on Iron and Steel**, 8vo., 1840; and *The Bessemer-Musket Process, or Manufacture of Cheap Steel*, 8vo., Chelt., 1883. **RILEY**, 3 vols., 1869.

STEEN (JOERGEN HAUSEN), built 1513-23 the schloss at Bergen for Christian II of Denmark.

STEENE (ÆGIDIUS VAN, or GILLES DE), 1221-6, ninth Cis-

tercian abbot of Notre Dames des Dunes, near Bruges, succeeding Amelius; the building was continued by Salomon de Gand, Nicholas van Belle, and completed 1262 by Theodorici. SANDERUS, *Flandria Illustrata*, fol., 1641-4, i, 249. 3. 68.

STEENE (PETER VAN), seventh Cistercian abbot, designed the new monastery begun about 1214, continued by Amelius, and by Egidius van Steene. 3. 68.

STEENHOUKEBELDE or Steenhoekveld (JAN THIERRI VAN), about 1406 rebuilt the upper part of the square central tower of S. Nicholas at Gand; its interior is worthy of examination. DE REIFFENBERG, *Statistique Ancienne de la Belgique*, 2 pt., p. 116.

STEENING or STEINING. The operation of lining a wall with bricks. A strong timber CURB is formed on the ground; the brickwork is carried up a certain height, and then the ground is dug out on the inside and beneath the curb, which allows the whole to sink; the same operation of building up and digging out, is continued; and the top covered over or arched over. If the shaft refuses to descend, any brickwork added under the curb is called "under pinning". BREESE, *II. Gloss.*, 8vo., 1853.

STEENWINKEL (HANS) of Eindhoven, where he was probably born. He was in the service of Christian IV (1588-1648) of Denmark. 1606-20 built or continued the castle of Frederiksborg, in Denmark, one of the latest Gothic works in that part of Europe (burnt Dec. 1859, as noted s. v. COPENHAGEN, wherein it is dated 1588-1648); DANCKAERTS, *Arch. Moderne*, fol., Amst., 1631, gives pl. 42, the gallery of the kings, as by Hans; who also built 1624 the portal of the exchange at Copenhagen; 1642 the round tower there for Longomontani, a pupil of Tycho Brahe; and built Uraniborg, and Stjerneborg, for Tycho. 68.

STEEPLE. The tower of a church including any superstructure, such as a spire or lantern standing upon it; *Glossary of Arch.* It is often applied to the spire only. CROWN STEEPLE. Bridlington priory, Yorkshire: "the steeple beyng towre flashyon", temp. 32 Henry VIII; *ARCHÆOLOGIA*, 1821, xix, 271. "A steeple which is a great building made of stone or other matter and is fourned broad and four square beneath and upwards small and sharpe as it were ye flame of fire which endeth sharpe"; BOSSEWELL, *Armory*, 1572, fo. 18b of the third book of "cotes and crests". 1426 Walberswick steeple, Suffolk; contract for it; 90 ft. high; partly blown down and repaired 1839-40. 1535, "received of the Goodman Stefford, ffre mason for the holle stepyll wt tymbwr iron and glas, xxxviij*l*"; G. B. HALL, *S. Alphege Church Records, London Wall*. "In the 22nd yeare of king Henry VI, uppon Candlemas Eve, in the afternoone, this steeple was fired by lightening, about the very middest of the spire or shaft"; CAMDEN SOCIETY, HAYWARD, *Annals of Queen Elizabeth*, 4to., p. 90; and 1540, *Steeple stayer*, in CAMDEN SOCIETY, *Ludlow Accounts*, 4to., 1867, p. 5, etc. 1500, new work of the stepyll, occurs elsewhere. *On Steeples*, in *ARCHITECT Journal*, 1879, xxii, 219; 235, 265, 282.

STEER; see PEARC, in drying deals.

STEERE (JAMES), surveyor, occurs in WEST AND TOMS, *Views of London Churches*, fol., 1736-9, pt. ii. In 1871 C. W. Cope, R.A., painted certain portraits including "Mr. Stear the architect of Guy's hospital"; with which building he appears to have had much to do, G. Dance having designed the front square, 1720-4.

STEETLEY STONE. A magnesian limestone obtained from near Worksope. Its weight and analysis are given s. v. Magnesian limestone. It has been used at Steetley church, *cir.* 1050; Worksope manor house; the Houses of parliament; the abbey church at Scarborough; and in the rebuilding 1855, etc., of Doncaster church.

STEFANI (PIETRO DE'), also a sculptor, born 1230; designed at Naples the church and hospital dell' Annunziata. He died 1310. DOMINICI, *Vite*, 8vo., Naples, 1840, i, 55-78. 67.

STEFANO, ..., born about 1301, a painter of Florence, disciple of Giotto (and by BALDINUCCI called the grandson of Giotto and son of Riccio di Lapo), gave buildings in perspective in his

paintings with great judgment, inventing a flight of stairs so well designed and commodious, that they served as a model to Lor. de' Medici the elder when constructing the external staircase to the palace of Poggio a Cajano, designed by Giuliano da San Gallo: Antonio da S. Gallo availed himself of the same in Orvieto. Stefano, who had the reputation of being also a good architect, died in 1350, aged 49, and was buried in the church of S. Spirito; his epitaph is given by VASARI, edit. 1850, i, 133-9. 73.

STEFANO (TOMMASO DI), born 1494, son of a miniature painter, who had also given some attention to architecture. He painted standards at Florence; and after the death of his father, he rebuilt the bridge at Sieve, near Florence; built the bridge at S. Piero a Ponte over the river Bisenzio, a fine work; numerous buildings for monasteries, and in other places; was appointed architect to the guild of woolworkers, for whom he prepared the model for their new houses erected behind the church of the Nunziata. He died in 1564, aged 70, and was buried in S. Marco, in the presence of the members of the academy of design. 73.

STEFANO (TOMMASO DI); see MASUCCIO II.

STEFFENS (meister ...), 1440-84 was employed on the *dom* at Danzig. HIRSCH, *Die Oberpfarrkirche*, 8vo., Danzig, 1843.

STEFFORD (...), 1535; see STEEPLE.

STEGA and steg. The Gr. for "stage"; a roof; a place covered over; a chamber; a tent; also the deck of a ship. HYPEROUM.

STEIN (F. ...) designed 1846 the *bethanien* or great new hospital with a fine chapel, at Berlin, and published *Das Kranken. Beth.*, fol., 1850. Also 1848 Gerson's mansion and magazine on Werder market, remarkable for its interior decoration.

STEINBACH (ERVINUS DE, or ERWIN VON), is said to have finished the nave in 1275, and then 1276-7 began the west façade and carried it up to the second stage, of Strassburg cathedral; the drawings on parchment were (1782) preserved in the archives. In 1316 he built the chapel of the Virgin therein, which was destroyed 1682. The early portion of the church at Thann, near Cologne (LABORDE, *Monumens*, fol., Paris, 1836, p. 25, pl. 190); and great part of Freiburg or Freyburg cathedral (SCHREIBER, *Munster*, 8vo. and fol., Karls., 1826, p. 7-8), are attributed to him. He died 17 Jan. 1318, and was buried in the cloister attached to the chapel of S. John Baptist, with an inscription "gubernator fabricæ ecclesiæ Argentinensis". The tomb is said to show his effigy, having a plan and compasses, and consulting with his wife Husa, who died 21 July 1316, and worked on the sculptures (part of the tomb was in the *frauenhaus*; *BUILDER Journal*, 1863, xxi, 681). A bust is in an upper gallery near a transept pier; and a statue has been raised to him near Steinbach. His style was the purest Gothic. He founded the lodge of masons at Strassburg. He had a son John, and another (Wynkin?), and a daughter Sabina (these two last seem mythical) who worked on the sculptures, carved the figures round the upper part of the shaft in south transept, and of the façade, and married her father's pupil Bernard von Sunden. GRANDIDIER, *Cath. de Stras.*, 8vo., Stras., 1782, p. 40-8; 348. SELVATICO, *Scultura*, fol., Ven., 1813, i, 470-6. F. MILER, *Deer. Novv. de Cath. de Stras.*, 6th edit., 8vo., Stras., 1817. BADER, *E. von St.*, etc., 8vo., Karl., 1844. *BUILDER Journal*, 1869, xxvii, 679, 711, 723, 731. 3. 25. 68. 92. 112. 113.

STEINBACH (HANS VON), born 1294, a son of the above, carried on the façade from his father's death, nearly up to the platform for the tower. He died 18 March 1339; his epitaph adjoins those of his parents. J. HILTZ. 92.

STEINBACH (WYNKIN (?) VON), another son, is stated to have built the collegiate church at Haselach, in the duchy of Baden, which is dated 1330-93. He died nonis decembris 1330 as stated on his tomb. 92.

STEINBACH (MATTHIAS VON), stated to be another son, employed 1344 at Berne, is probably Matthias HEINZ alias Ensinger.

STEINHAEUSER (LEONHARD), succeeded H. Buchsbaum as baumeister 1455-65 (?) to the tower of the cathedral of S. Stephen, at Vienna. 92

STEINMETZ. This German word for "mason", appears to have been used for an architect or master mason, at the time when 1415 herr Johan Ecke is called "canonicke und eyn buwemeister derselben kirchen", *baumeister* then being warden or guardian; PASSAVANT, *Kunsttreise*, 8vo., Frank., 1833, p. 433, 436-7. Werner von Koldenbach, steinmetz, went about 1280 from Cologne, and directed as *meister* the construction of the church of S. Catherine at Oppenheim. Meister Weltz der Steinmetz 1377 to 1409 was engaged at Wuerzburg. Meister Hans Steinmetz von Muenchen 1455-60 built at Tegernsee. Hans Steinmetz, about 1430 built at Landshut, Halle, Oetting, Salzburg, and Straubing. Marx Steinmetz 1516 was *baumeister* at the cathedral at Ulm. GOULD, *The Steinmetzen of Germany*, in *History of Freemasonry*, 4to., London, 1882, i, 107-78. 92

STELA. One of the four memorials placed over the grave, being a pillar or upright tablet, usually terminated with an oval heading called *ἐπιθήκη*, and ornamented. Among the Sicyonians it had a pediment. One found at Khorsabad is given in PERROT and CHIZEZ, *Art in Chaldæa and Assyria*, 1883; and in *BUILDER Journal*, 1883, xlv, 820, pl. A large number found at Delos; BLOUET, *Morée*, fol., Paris, 1836, iii. In France; and in the British museum; DALY, *Revue Générale*, v, 114; xx, 85. At Athens, in INWOOD, *Erechtheion*, fol., Lond., 1827, p. 145, pl. 31. CIPPUS. EPITHEMA. 16. 19.

Also the ornament on the ridge of the roof of a temple.

STELLA (GIOVANNI), practised XVII cent. in Poland. 68.

STELLAR VAULTING; see STAR PLAN.

STEM. The foremost piece of timber in a ship. PROW.

STENCH TRAP. A common word for any sort of trap secured by water to prevent the rise of smell from drains, etc. They are all more or less alike, from the common D TRAP, S TRAP, P TRAP, each acting as a syphon trap. The class will be considered generally *s. v.* TRAP. AIR TRAP. BELL TRAP. GRID.

STENCIL, or stanesile, or "slabdashings". 1255-6, 40 Henry III, at Guildford castle to paint the ceiling of the king's chamber becomingly stencilled (extencellari); TURNER and PARKER, *Dom. Arch.*, 8vo., 1851, i, 246. 1352 Jan., "Two quarters' of royal paper for the painters patrons", and "six dozen and eight leaves of tin for the pryntes (? stamps)"; BRAXLEY, *Westm. Palace*, 8vo., 1836, p. 183. A mode of decorating walls and surfaces where economy is an object. In early times the plastered walls were first coloured and then a pattern stencilled on it, being the precursor of paper hanging. The outline is drawn on drawing paper, card board, or other usual paper and cut out by a sharp knife cutting on glass so as to have a clean cut; the paper to have coats of knotting varnish so as to make it tough and resist damp. For fine work tin foil and lead foil are better. Zinc where much wear is expected. The material is then put flat and held tight on the coloured or painted surface and a brush with another colour passed lightly over the pattern, which on removal shows the pattern; this may have another stencil worked on it, or be finished up by hand-work. CALQUING. *Paper Staining*, in *BUILDER Journal*, 1858, xvi, 457. *Stencil Cutting*, in *THE FURNITURE GAZETTE*, for April 1884, p. 315, etc.

Prior Birde's chapel at Bath, 1515; the front next the choir was found unfinished; it showed that the stone was first shaped, then a black coat of water-colour was put on, the drawing for the carving pricked through and the outline obtained by using white pounce; DAVIS, *Oratory*, fol., Lond., 1834.

STENDAL. An ancient town in Prussia, and the former residence of the margraves of Brandenburg. The walls originally of granite were repaired xv cent. with brickwork and rich terra-cotta work. The Uenglinger gate is 87 ft. high, *Illustrations*, Tower, No. 247 or 152; Tangermünde gate 1460 is on an older granite base; there are three others. The cathedral dedicated to S. Nicholas, is of good brickwork; the tower and transepts are the oldest parts; the three aisles are of nearly equal

height, choir stalls 1430, rood-loft 1450, painted glass 1480. Marienkirche, late Gothic, three aisles of nearly equal height, with the side one continued round the choir; vaulting completed 1447; S. Jacobikirche, and two other churches. The *rathhaus* is late Gothic; the Rolandsäule in front dates 1525. A statue 1859 to J. J. Wincklemann (1718-68). 28. 50. 92.

STENDARDO (MATTEO), designed 1682 (?) the church of S. Giovanni in porta, at Naples. 95.

STENDÖS. The name given in Sweden to an ancient sepulchre whose walls are formed of large thick stones in one height, smooth on the inside and rough outside; *BUILDER Journal*, 1886, 14 Aug., p. 229.

STENGEL (...); see WÜST (...), at S. Petersburg.

STENGLIN (CONRAD), of Ulm, built 1414 the monastery of barefooted friars at Noerdlingen; he entered the service of the emperor Sigismund, and in a document of 1439 is called "werkmeister", at which time he had returned to Ulm. 68.

STENZELBERG. The quarries supplied the stone for the new works at Cologne cathedral. COLOGNE.

STEP (Med. GRE; *degrece*; Scotch, *stip sole*; Fr. *gradin*). The riser and tread, in a flight of one or more steps. Stone steps are either set on solid ground, or are carried on arched work of stone or brick, or by iron girders; of the former many ingenious examples are to be seen in the French buildings of XVII and XVIII centuries. In a stone staircase, one end of the step is pinned into the wall, the riser resting on the edge of the step below it and fitted to it by a PIEN JOINT, or other arrangement. Wood steps are carried on carriages and let into strings at each end. STAIRCASE. 1.

The Greek temples generally stood on one or more steps. "The *κρηπίς* (of the temple at *Ægina*) is composed of three lofty steps, of which the middle one is the least, as is the case in most of the examples. The proportion which these always bear to the column itself, whether large or small, is in the ancient examples nearly the same (something more than one-third of the diameter, without any reference to their use for access to the temple), proving clearly that the *κρηπίς* stylobate was always considered by the Greeks as an essential and constituent part of the Order"; COCKERELL, *Ægina*, fol., Lond., 1860, p. 24; and the Theseium at Athens has only two steps, one being given to the additional height of the column; (p. 23). The step to the temple of Diana at Ephesus is 19 in. tread by 8 in. riser; FERGUSON, at ROYAL INST. OF BRIT. ARCHTS., 1877, p. 87.

1623; Steps 9 ft. to 11 and 12 ft. long; to be $5\frac{1}{2}$ to 6 in. riser and 12 in. tread besides the projection or nosing, usually 2 in. In turning, ten steps may come in the half-circle; when 18 ft. wide then about twelve steps; LE MUET, *Art of Fair Building*, transl. by PRICKE, fol., 1670, p. 2. At the Farnese palace, at Rome, the tread slopes to the nosing, the step is 128 rise, 18 slope, and 536 width from nose to nose; LETAROUALLY, *Rome Moderne*, p. 281. The steps to the north portico of S. Paul's cathedral are $5\frac{1}{2}$ in. riser and $14\frac{1}{2}$ in. tread.

The breadth, or tread, is usually from 9 to 12 in., or about 10 in. at the medium; in the best stairs it ought never to be less than 12 in. nor more than 18 in. The greater the breadth the less the rise; thus 12 in. will require $5\frac{1}{2}$ in.; which may be taken as a standard. Thus the two multiplied make 66 in. If a step be 10 in. broad, the height should be $\frac{66}{10} = 6\frac{2}{3}$ ths in., which is about what common practice allows. TREGOLD has given the proportion that twice the rise added to once the tread, should always make up twenty-four inches, the usual step of a person of ordinary stature; thus a step $6\frac{1}{2}$ in. rise, should be $11\frac{1}{2}$ in. tread; or $6\frac{3}{4}$ in. rise to be $11\frac{1}{4}$ in.; a good proportioned step; ARCHITECT *Journal*, 1850, ii, 446.

Tread	7 in. riser	8 in.	Tread	12 in. riser	$5\frac{1}{2}$ in. to 6
" 8	"	$7\frac{1}{2}$ to 8	" 13	"	5 to $5\frac{1}{2}$
" 9	"	7 to $7\frac{1}{2}$	" 14	"	$4\frac{1}{2}$ to 5
" 10	"	$6\frac{1}{2}$ to 7	" 15	"	4 to $4\frac{1}{2}$
" 11	"	6 to $6\frac{1}{2}$			

SPON'S *Architect's*, etc., Pocket Book, 1876.

N N

Among the materials of which steps have been made are the following. See also TREAD. Irish stone or marble; 1699 at Kensington palace, and Hampton Court; and *cir.* 1700 at Marlborough house. Portland stone; see SMITH, *Lithology*, p. 160; tooled, sawn, and rubbed. Green moorstone at Bread Street hill, London. Darley Dale stone, at Gresham Chambers, Old Broad Street. Craigleith stone, 1780, to be "brothched, droved, and polished". Hopton wood stone. During the mediæval period, steps of freestone were carried on concrete as in many of the winding staircases.

Of oak, in thickness, or solid work. Two steps cut out of one log is shown in VIOLLET-LE-DUC, *Dict.*

Of elm, at Tong hall, Shropshire (NEALE, *Seats*, v).

Of Portland cement concrete, etc.

Of terra-cotta, or earthenware, fireproof, by M. H. Blanchard, tread and riser in one; *BUILDER Journal*, 1858, xvi, 197, 252.

Brick, fireproof, at Fryerning church, Essex; BUCKLER, *Churches*, 57. Lindsay's patent blocks, 1882, used at stairs 8, New Court Chambers, Lincoln's Inn, by A. Waterhouse, R.A.

STEP, or stepped, FLASHING; see FLASHING.

STEPHEN. Maître Estienne was 1550-5 employed at Langres.

STEPHEN "THE ALMAIN", properly Stephen de Hashomperg. An engineer in the service of king Henry VIII. Probably only the following is known of him:—1539, from 30th March, 31 Henry VIII, he was directing "the workes of the kinges castle at Sandgate", to 2nd Oct. 32nd year, when it "was fully finished and completed"; R. Scott was surveyor and R. Keys, paymaster; the nineteen monthly "leger" books are now in the British museum, *Harl. MSS.* Nos. 1647 and 1651; LEWIS, *Custies of Sandown and Sandgate*, read at BRITISH ARCHAEOLOGICAL ASSOCIATION, 1884, p. 175. 7 Nov. 1540, the deputy of Calais "to receyve Steven the Almayn and to cause the surveour to joyne with him in the view of the marches for the devising of a platte of the same —, but that in no wise they shulde soffre hym to view the townes of Calais or to se the secretes of the same." 16 Nov., "to appoint Francis Hall to joyne with Stephen for the making of the platt." This "platt", now in the Cottonian Coll. (Aug. I, ii, 71) is reduced p. xxviii, in CAMDEN SOCIETY, *Chronicles of Calais*, edit. by Sir N. H. Nicolas, 1846, p. 79, 83, 197; *Proceedings*, etc., of the Privy Council, vol. vii, index, p. 360. It is probable he may have built Tournay castle before 1518 for the king; p. 17-8 of *Chronicle*. 1541-2, 3 July, 33 Henry VIII, Stephenus de Hashomperg or Steven von Hassemperg "was master of the works" at Carlisle, executed fortifications for the defence of the border, with T. Gower; he complained against the captain of the castle; *Add. MS.* 6362, f. 3, with three receipts of moneys, *Add. MS.* 5754, f. 81-6. He was paid 4s. per day; William Garfurth overseer. The *Calendars* for this period are not yet issued. W. P.

STEPHEN (EDWARD); see STEVENS (E.).

STEPHENSON (DAVID) of Newcastle-upon-Tyne. As carpenter 1772 he erected the temporary bridge across the Tyne; 1787-8 designed the theatre royal; 1786 consulted on the dangerous state of All Saints' church, which was rebuilt 1786-96 from his designs; 1789 circus or riding school, roof 64 ft. clear, 76 ft. long, and 30 ft. high to the foot of king-post; a section with dimensions is given in CIVIL ENGINEER *Journal*, 1843, vi, 147; 1795, repaired the steeple, pointed and painted and put a new copper vane to S. Nicholas church; MACKENZIE, *Newc.*, 4to., 1827, p. 255; was architect to the duke of Northumberland. He was a subscriber 1808 to J. Johnson's *County Hall*, Essex. T. C. Dobson was a pupil ending 1809.

STEPHENSON (STEPHEN). "A native of England, was according to the account of those who are supposed to have had their information from the records of the royal archives of Lisbon, the name of the architect of the church of the priory of Batalha," erected 1386-1402; as stated in MURPHY, *Travels in Portugal*, 4to., London, 1795, p. 44. He is also said to have been sent about 1386 or 87 from the lodge of masons of York,

and that the church must have been built by one who had well studied the York minster of that time. RACZYNSKI, *Lettres*, 4to. and fol., Paris, 1836, p. 334. This is now doubted. BATALHA. OUGUET. A. DOMINGUEZ. 68.

STEPS. A kind of ladder, but having flat surfaces instead of rounds. They are also made folding, that is with a frame hinged at the top to draw out and form a figure A, the feet being secured from stretching by a cord or chain. Small "steps" formed in a similar manner are used in libraries and such places, for access to upper shelves. Painters have such steps or ladders called "tressels", to carry boards across for work to ceilings, etc.; they are hinged on each side at the top.

STEPUL (JOHN DE), 1391, 14 Richard II, agreed with the "abbot of Derleye" (Darley) for the erection of a bridge over the river Derwent at Derby. *Add. MS.*, British museum, No. 6671, p. 118; PECK, *Monast.*; *Harl. MS.* 4937, f. 132.

STERCULIA FETIDA. A large tree on the west coast of Mysore; supposed to furnish the smaller poon spars, the true poona being very dear. CALOPHYLLUM. DILLENTIA.

STEREOBATA; also STYLOBATA. In English, a PEDESTAL, as to a column; it consists of the base, the die or dado, and the cornice. The former term is applied when used under a plain wall; the latter to an insulated column. SCAMOZZI used the It. *pedonato*. 1, 19.

STEREOCHROME (Fr. *stéréochromie*), written "sterio-chromie" in HOWITT, *Art Student in Munich*, 2 vols., 1853, i, 239, and described as the invention of the Oberberggrath von Fuchs. *BUILDER Journal*, 1845, iii, 422, mentions that prof. Schlott-hauer had followed up for years the idea of Fuchs. "Painting done with colours chemically prepared, and on a coat materially analogous with them. On canvas it combines into a thin integument with which it becomes saturated; in mural paintings it is used as a coat of only a few lines in thickness, which, however, unites even with the hardest substratum into a mechanically inseparable mass." It was adopted by Kaulbach. *BUILDER Journal*, 1863, xxi, 292. DALY, *Revue Générale*, 1851, ix, 234. SLICEOUS PAINTING.

STEREOGRAPHY. The art of drawing the forms of solids on a plane.

STEREOTOMY (Fr. *coupe des pierres*). The science of cutting stone and wood to give them the proper form for construction. XV cent., "craite of coryous masonryre"; LYDGATE, *Descr. of Troy*; in PARKER, *Dom. Arch.*, 8vo., 1859, iii, 38-9. 1566-7, 10 Dec., 9 Elizabeth, "science of masonry", in agreement for windows, near Worsborough, Yorkshire; HUNTER, *South Yorkshire*, fol., Lond., 1831, ii, 278. *Stone Cutting during the Middle Ages*, DALY, *Revue Générale*, 1856, xiv, 301; xv, 195. QUICHERAT, in *Revue Archéologique*, 1849, sixth year. LENOIR, *Arch. Monastique*, 4to., Paris, 1856, ii, 272-4. Oronce Finée taught the science to P. de l'ORME who popularised it by the two sections in his *Architecture*, 1567, which for nearly a century remained almost the only work on the subject. JOUSSE, *Le Secret d'Architecture*, fol., 1642; 1702. BOSSE ET DESARGUES, *La Pratique—pour la Coupe des Pierres en l'Architecture*, 4to., 1643. DE LA RUE, *Traité de la Coupe des Pierres*, fol., 1728. SIMONNIN ET DELAGARDETTE, *Coupe des Pierres*, 4to., 1792. FREZIER, *La Théorie et la Pratique de la Coupe des Pierres, et des Bois, pour la Construction des Voutes, etc., ou Traité de Stéréotomie*, 4to., Stras., 1737. DOULIOT, *Traité spécial de Coupe des Pierres*, 2 vols., 4to., Paris, 1825. ADHÉMAR, *Coupe des Pierres*, 8vo., 1836; 1840. NICHOLSON, *Practical Masonry*, 1826, and edit. by ROBSON, 4to., 1854; 1862. ELMES, *Lectures*, 8vo., 1821, p. 264. LE ROY, *Traité de Géométrie*, etc., 8vo., 1845; 1850. CLAUDEL ET LAROCHE, *Maçonnerie Pratique*, 8vo., *cir.* 1848. DOBSON, *Rud. Treatise on Masonry and Stone Cutting*, 12mo., 1849. STONE CUTTER. 1.

STERLING; see STARLING; and STILT.

STERN. Steerage, helm, or rudder. The hindmost part of anything, as the hanging stile of a dock or castle gate having a pivoted end. R. R. R.

STERN (GIOVANNI), designed a small palace in Campo Marzo at Rome; LETAROUILLY, *Rome Moderne*, 4to. and fol., Paris, 1825-60, pl. 18, p. 162. Published *Piante, etc., della Villa di Giulio III, pont. Massimo*, 30 pl., fol., Rome, 1784.

STERN (HANS or JOHANN GEORGE), also known as Hans von Ingoldstadt, and Stella. He was 1551 baumeister to the duke at Ingoldstadt, where he built the granary and restored the castle. Between 1558-82 he was in the service of the Jesuits for whom he built the church and college. The date of his death is not known, but he was living in 1563. GOULD, *Hist. of Freemasonry*, 4to., 1882, i, 131. 68.

STERN (RAFAEL), of Germany, brother (or son) of the above, was engaged 1812 to superintend the preparations at Rome for the reception of Napoleon, and employed Thorwaldsen to execute a frieze, "the triumph of Alexander", for a large apartment at the Quirinal; and was employed by pope Pius VII (1800-22) to design 1817 the new gallery, called Braccio nuovo, in the Vatican, 230 ft. long, which being incomplete at his death 1821 was continued by P. Belli. He or another R. Stern was the author of *Lezioni di Architettura Civile*, 4to., Rome, 1822. 68.

STETTIN (Lat. Sedinum). The capital of the province of Pomerania, and an important port of Prussia, situated on the river Oder, crossed by two timber bridges each about 400 ft. in length, and others over other streams of 120, 380, and 630 ft. The walls were destroyed and since 1854 a new town has sprung up on their site, having fine buildings. Among the five churches are S. John's, having three aisles of equal height, and a choir with seven sides out of ten; Marienkirche 1336, now an arsenal; Peterkirche, xv cent., a nave with five-sided apse; Jacobi kirche, 1187, three aisles of equal height, the aisle continued round the five-sided choir; modern vaulting; roof in one span continued over the whole; its one tower finished 1504 by H. Boenecke. A royal castle or palace 1575 in which resided the former dukes of Pomerania who died out 1630; with a schloss kirche wherein they are buried, is now the official residence and government offices. The *rathhaus* dates 1225; opposite is the new exchange. Also a gymnasium with a great library, observatory, and museum attached; the Johanneskloster or almshouse, Friedrich Wilhelm's school; large artillery barracks, and prison: a marble statue of Frederick the great, 1793 by Schadow; and another of king Frederick Wilhelm III, by Drake. View in ILLUSTRATED LONDON NEWS, 1847, x, 84. PERRY, *Brickwork of Pomerania*, read at Royal Institute of Brit. Architects, *Sessional Papers*, 1873-4, p. 18-9. BALTIC TIMBER. 14. 28. 50. 92.

STEUART or STEWART (GEORGE), designed 1786-91 Stoke Park house, or Earl Stoke, Wiltshire, for Joshua Smith, esq. (later occupied by G. Watson Taylor); NEALE, *Seats*, 1822, Ser. 1, v; and RICHARDSON, *New Vitruvius Britannicus*, fol., 1802, i, pl. 38-41; also Attingham, Shropshire, with stable offices, for right hon. lord Berwick; *idem*, ii, pl. 25-8. 1788 a church at Wellington, Shropshire; two engravings in the King's collection at the British museum. 1791 S. Chad's church, Shrewsbury. He died Dec. 1806 at Douglas, Isle of Man.

STEVENS (EDWARD), A.R.A. (1770); was about 1762 a pupil of sir W. Chambers, while in Poland street. Exhibited at the Society of Artists of Great Britain, 1765; in 1766, at which time he left his master, a design for a town mansion for a person of distinction; 1767, new front now making to the old house at Spye park, Wiltshire, the seat of sir Edw. Baynton, bart.; and exhibited also in 1768. In 1769 he competed for the exchange at Dublin, and was one of three selected out of 64 designs (MULVANY, *Life of Gandon*, 8vo., Dublin, 1846, p. 32); the design was exhibited the following year; and among others in 1771 was Doveridge hall, for sir Henry Cavendish, bart. He died at Rome in 1775.

STEVENS (ALEXANDER), was engaged on canals, etc., in England and Scotland; and 1783-91 designed Sarah bridge, over the river Liffey, Dublin. He died in 1796. 68.

STEVENS (ISAAC HENRY as in obituary, usually written H. I. S.), of Derby; 1850, F.R.I.B.A. He designed many

churches, as 1841 Trinity church, Nottingham (CIVIL ENGINEER, ETC., *Journal*, iv, 402); 1850 S. Paul, Rushall, near Tunbridge Wells (ILLUSTRATED LONDON NEWS, xvii, 177); S. Alkmund's and S. Michael's in Derby; London Road Congregational church; the village churches of Mackworth, Allestree, Mickleover, and Atlow near Ashborne; 1858 memorial chapel at Repton school; (BUILDING NEWS *Journal*, iv, 901). Many public and private works, as Training college for mistresses in Uttoxeter road; repairs and the Nightingale wing at Derbyshire infirmary; 1863 new Borough market £10,560; and for Francis Wright, esq., the house, etc., at Osmaston manor, near Derby; 28 Apr. 1851 read *On the System of Smoke Conduction and Ventilation adopted there*, at ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1850-51. He retired a few months before his death 30 April 1873, aged 66, at Holly Bank, Normanton, and was buried at Repton church. His brother, E. N. Stevens of Rushall, Tunbridge Wells, was also an architect. DERBY AND CHESTERFIELD REPORTER, 9 May; and DERBYSHIRE ADVERTISER, May 9. F. J. Robinson was a pupil and became about 1859 a partner.

STEVENS (JOHN HARGRAVE), son of deputy Stevens of the city of London, was a pupil of W. Wilkins, R.A., at Cambridge, where he was interested in several buildings. He was associated with Charles Pearson, solicitor to the corporation of the city of London, in surveying, etc., for the early plans for metropolitan railways, the Holborn Viaduct, etc. In 1843 he was elected surveyor for the western district of the city. As partner with Geo. Alexander (died 10 Sept. 1885) they designed about 1843 the churches at Ramsgate, and at Farnborough station; 1843-4 S. Mary's church, Herne hill (ILLUSTRATED LONDON NEWS, 1844, v, 353); 1844-5 S. John's church, Ladbroke grove, Notting hill, *idem*, vi, 124; and BUILDER *Journal*, iii, 54; 66; besides many houses on the estate; 1844-5 the church at Surbiton near Kingston-on-Thames (I. L. N., 1845, vi, 29), and were architects to the proprietors of the town. Stevens 1848-9 designed a house in Milton street, Fore street, £1,774; the R. C. schools on Saffron hill; and made large alterations to the *Morning Advertiser* newspaper office in Fleet street. Among his pupils were the late Thomas Grundy (died 1870 at Toronto), and Alex. Graham, F.R.I.B.A. He died on 2nd or 6th June 1857. His son, of the same names, was district surveyor for S. Matthew, Bethnal Green, and died about 1875.

STEW (Gr. *ichthyotrophion*). A pond for keeping or breeding fish. The castle was frequently, the abbey or monastery invariably, provided with a stew-pond to supply fish, of which there was a large consumption in the mediæval period. A pond or vivary in the garden of the earl of Lincoln in Holborn 24 Edward I (1295-6), the bailiff expending 8s. for small fish, frogs, and eels to feed the pikes in it. The kitchens of monasteries were often placed near to or over a stream where the water could be dammed up to form a preserve. TURNER AND PARKER, *Dom. Arch.*, 8vo., 1851-3, i, 140; ii, 130.

STEWARDS ROOM. The steward of a large establishment orders and receives everything supplied by the tradespeople. He requires an office or private room, and probably a bedroom adjoining, and a small safe for books and papers. It should be near the kitchen entrance and larders, and easily accessible from the secondary entrance, also convenient to the house-keeper's and butler's departments. The kitchen clerk's office for checking, weighing, and keeping the accounts must also adjoin the kitchen and larders; it is fitted up with desk, dresser, balances, shelving, etc., and perhaps may be a store-room itself. KERR, *Gentleman's House*, 8vo., London, 1871, 3rd edit., p. 228. SURVEYOR.

STEWART (GEORGE); see STEUART (G.).

STEWART (JAMES), jun., designed the chapel near Redland court, Bath, for John Cossins, esq., Oct. 5, 1743; BRITISH MUSEUM, the King's collection. STRAHAN (...).

STEWKO; see STRUCCO.

STEY. A ladder; see STEE. STAYERS. STAIRS.

STHAMB; STHAMBAS. A single pillar, the oldest form of

Tope, connected with the Buddhist religion; when of one stone it is termed LAT.

STHUPA; or Tope. They are of two classes: 1, to contain relics; 2, to mark sacred spots, and commemorate events in Buddhist history. The one is properly called "dagoba", the other might be called "sthupa". TOPE.

STIACCIATO. The Italian term used in the time of VASARI for the flattest or least raised work of sculpture. BASSO-RELIEVO. 14.

STIBADIUM. The seat, of a half-moon form, and to hold eight persons, in a Roman COENACULUM. DINING-ROOM. SIGMA.

STICK. A young timber tree; a small log of timber; or a log of small sectional area. Also a small piece of wood, as "deals sticked under sheds to season, with a stick between each board", 1877. PEARC. STACKING. RACK.

STICKELLES and STICKLES (ROBERT). In 1583 and 1584 he was employed by the crown on "various works at Dover Haven"; weighed five rocks, and progress of jetty by him (ROLLS SERIES, *Calendars*, 1865, 8 references). 1594 the Grocers' company, the hall begun 1427 being then only a shell, "took counsel how it might be wainscotted, which business was performed by a Mr. Stichells who was to oversee the work at the wages of 20d. per day, his two chief workman 18d., the rest 16d. and two boys at 8d. a daie"; HEATH, *Grocers' Company*, 4to., 1854, p. 12. "Stow, *Chronicle*, p. 769, mentions one master Stickles, an excellent architect of that time, who, in 1596 built for a trial a pinnace that might be taken to pieces"; WALPOLE, *Anecdotes*, edit. 1849, i, 185. Plan of the ranger's or Richmond lodge by him, is given in J. Thorpe's Book of Drawings in sir John Soane's museum, p. 150; GWILT, *Encyc.*, edit. 1867, and 1876, § 440. In 1597, "Observations on the Properties of Buildings by R. S."; "recommended Sept. 1595 by the earl of Derby for the surveyorship of the queen's works"; are in the British museum, *Lansdowne MS.* 84, No. 10, p. 25-6, and given in *BUILDER Journal*, 1860, xviii, 588; but W. Spicer appears to have been appointed. 3.

STIDDIE, STITHY, stethy. Terms used in West Riding of Yorkshire, for an anvil. *ARCHAEOLOGIA*, 1814, xvii, 159. SURTEES SOCIETY, *Finchale Priory*, 1465; 8vo., Newc., 1837, p. 449.

STIEGLITZ (CHRISTIAN LUDWIG), born 12 Dec. 1756, at Leipzig, was a voluminous writer on architectural history and art; the following are the chief works. In 1786 he appeared in the *Versuch über die Baukunst*; wrote *Geschichte der Baukunst von den Alten*, 8vo., 1792; *Encyclopædie der bürgerlichen Baukunst*, etc., 5 parts, 8vo., 1792-8; *Die Baukunst der Alten, nebst einem Arch. wörterbuch*, 8vo., 1796; *Artistische Blätter* (on decoration), 1800; *Plans et Dessins tirés de la belle Architecture*, 115 pl., fol., Leip. and Moscow, 1800; Paris, 1801 and 1809; *Zeichnungen aus der schönen Baukunst*, 1804; *Gemählde von Gärten im neuen Geschmacke darg.*, new edit., 1804; *Versuch einer Einrichtung antiker Münz-Sammlungen*, etc., 1809; *Alt-deutsche Baukunst*, 34 pl., fol. and 4to., 1820; *Geschichte der Baukunst vom frühesten alterthume*, etc., Nur., 1827; 1836; 1837; *Ueber die Kirche der heiligen Kunigunde zu Rochlitz*, etc., 8vo., 1829; *Documents relatifs à l'Histoire—de l'Arch.*, 1834; *Beiträge zur Geschichte der Ausbildung der Baukunst* (temples), 25 pl., 2 vols., 8vo., 1834; *Die Baukunst der Alten handbuch für Freunde der Kunst*, 8vo., 1796; and with PUTTRICH, *Denkmale der Baukunst des Mittelalters in Sachsen*, etc., fol., 4 vols., 1836-52. In 1830 he retired from public duties, and died 17 July 1836, at Leipzig. A notice with a portrait is given in *ALLGEMEINE BAUZEITUNG Journal*, 1838, i, 423-6. ESPE, *Funeral Oration*. 14. 68.

STIER (GUSTAV WILHELM), professor at Berlin; 1822-5, accompanied Hittorff and Zanth to Italy and Sicily. He published *Vorlegeblätter für Maurer und Zimmerleute*, fol., Berl., 1841; *Designs for Architects and Builders*, pt. 1, fol., 1851; *Geschichte und Beschreibung der Stadt Pompeji*, 8vo., Witt., 18... and 1853; *Inscriptiones Vittebergæ Latinæ*, 16mo., 1853, etc.; *Wittenberg im Mittelalter*, etc., 8vo., 1855; *Die Schlosskirche zu*

Wittenberg, 8vo., 1860; and designed, among other buildings at Berlin, in 1855 one of the two new synagogues. 68.

STIFFENER. A piece of iron T-shape, applied to the web of a plate girder. If splayed out clear of the angle irons, they will cost about half of the cost for smithing them when made to fit close round them and answer the purpose equally well. They cannot be adopted where the flanges are too narrow to admit of four rows of rivets; but when the flanges are of sufficient width to admit four rivets at one cross section, but require only two for their construction, the additional rivets can generally be put in without taking from the strength of the girder. The flanges of plate girders usually possess an excess of strength at points not very far distant from each other, owing to the unvarying thickness of the plates; it is at these points that stiffeners should be put in, if they can be so arranged as to be equidistant. If this cannot be effected, the cost of making extra templates, and the trouble caused during the construction, will more than counterbalance any economy to be derived by taking advantage of this fact; *BRIT. ARCH. J.*, 22 June 1877.

STIFFNESS. That property of bodies by which they resist bending or flexure: flexure or deflection being the space through which a body is bent by means of the stress or straining force. RIGIDITY. TURNBULL, *On Strength and Stiffness of Timber*, 8vo., 1833. "If a tube indefinitely thin be expanded into a similar tube of a greater diameter, but of equal lengths, the quantity of matter remaining the same, the stiffness will be increased in proportion of the square of the diameter, and the strength in the ratio of the diameter. Hence hollow cylinders of equal lengths, by any increase of diameter, increase in stiffness in a much higher proportion than strength"; BUCHANAN, *Millwork*, 8vo., 1841, p. 226.

STILE. The vertical framing of a panel into which the ends of the rails are fixed by mortises and tenons. A door has a "hanging stile"; a middle stile, or mounting stile (abbreviated to muntin or munting, or munnion); and a shutting, falling, or meeting, stile. DOOR. 1. 25.

The Cornish stile for preventing cattle having access to private grounds, etc., by fixing stone blocks with a space between, is described in *BUILDING NEWS Journal*, 1860, vi, 747. In Gloucestershire, the "opening stiles" are called "evers" or heavers; the top rail having an iron bolt driven through it at one end, the other falling into a notch in the opposite post; BLACKER, *Gloucestershire Notes and Queries*, 8vo., 1884, ii, 588.

STILL-HOUSE; ROOM, and Stillatory. A room used in XVI century as at Hengrave hall, Suffolk, for the distillation of household cordials then so highly prized among the arts of housewifery. Now provided for preparing tea and coffee, making preserves, cakes, and biscuits. It should adjoin the housekeeper's room, and store room. KERR, *Gentleman's House*, 8vo., 1871, 3rd edit., 225.

STILICIDIUM. In Doric buildings, the roof terminates in a stilicidium or dripping eaves, but in the propyleum at Eleusis, the sima or upper moulding of the pediment cornice is continued along the flanks, and a channel is hollowed in it for the purpose of collecting the rain falling on the roof. 2.

STILLING (...), designed 1847 the casino theater in the Amalie-Gade, at Copenhagen; *ALLGEMEINE BAUZEITUNG Journal*, 1850, pl. 309-10.

STILOBATE; see STYLOBATUM.

STILT. Piers of timber bridges were formerly built upon piles, called "stilts", whenever the masonry could not be laid dry upon the bed of the river; these piles were afterwards cut off at the level of low-water mark, and the stone or brick piers built upon them. They were surrounded a few feet off by a row of piles; and the place thus enclosed was called a STARLING or jetty, and was filled in with loose stones or rubble work. In early works the arches were commenced on paving laid on the top of the piles. This method of erecting a pier has been superseded by CAISSONS, then by the COFFERDAM; and lately by iron CYLINDERS. 1.

STILTED ARCH; etc. An arch formed on short upright sides. "It cannot always be avoided where openings of different breadths are required to be of the same height"; FREEMAN, *History of Arch.*, 1849, p. 56; 70; 272. **SEGMENTAL**. ALBERTI, *Archit.*, I, xii, recommends that all semicircular arches should be stilted one seventh of half the span for strength, effect, and appearance. The Byzantine arch surmounted a quarter of the diameter, a feature especially observed in buildings erected under Basil and Constantine Monomachus (VIII) 975-1028; TEXIER, *Armenie*, fol., 1842-52, i, 110. A highly stilted arch is seen in Agia Theotokos, probably end of IX cent., SALZENBERG, *Alt. Christ. Baud.*, fol., 1854. **HORSE-SHOE ARCH**. Shafts of columns have been stilted, as at the Baths at Nîmes, and in baptistery of Constantine where a row of leaves appears above the base; at Rome, by adding a molding between the shaft and the base, to heighten an old shaft; the use of the pedestal, etc. The stilted bases of the XV century piers in churches may have been devised partly to show the bases clear of the seating. The same thing was done in some of the churches designed by Sir C. Wren and others, raising the bases clear of the pewing. The octagonal bell tower to the church of S. Jacques, end of XIII cent., at Toulouse, is of brick; the heads of its numerous windows are stilted and formed with slanting sides; VIOULET-LE-DUC, *Dict. Rais.*, s. v. Clocher, p. 395. 17.

STILUS, *stylus*, or *graphium*; see PEN.

STINK or **STENCH TRAP**; see TRAP.

STINK STONE; see LUCULITE.

STINT. The stop to a CHAMFER.

STIPULATED DAMAGES; see LIQUIDATED DAMAGES.

STIRLING HILL STONE; see PETERHEAD GRANITE, and GRANITE (p. 73).

STIRLING'S PATENT IRON or **TOUGHENED IRON**. By this manufacture a saving in weight of about one-fourth of the quantity that would have been necessary with ordinary iron, is stated to be effected, without any diminution of the absolute strength. Morris Stirling "introduced the manufacture, by an admixture of scraps of wrought iron, intimately incorporated with the fluid cast iron whilst running from the blast furnace, formed a mixture which, when remelted and run into castings, produced a metal possessing great strength, deflecting less than ordinary cast iron under similar weights, and having less permanent set." The cast-iron viaduct at Manchester forming part of the joint station of the London and North Western, with the Manchester, Sheffield, and Lincolnshire railways, was formed of it. Report of J. OWEN on *Experiments on Cast and Toughened Irons*, 4to, 1847. *Experiments*, 8vo., 1849. **INSTITUTION OF CIVIL ENGINEERS**, *Proceedings*, 1851-2, xi, 239. Report of the Commissioners appointed to inquire into the application of *Iron to Railway Purposes*, fol., 1849, gives experiments.

STIRRUP IRON (Fr. *étrier*), or **STRAP**. A piece of strong iron formed to carry a joist against a girder; or to carry or suspend a girder receiving a series of joists, from a higher one or a bressumer, as is often done where a shop-front is formed higher than the first floor. These straps are "dog nailed" to the girder. A "stirrup piece" in timber bridges is an inclined clamping-piece to strengthen a strut when inclined to sag, and is fastened to it and to the longitudinal straining- or string-piece. 25.

STITHIAN GRANITE, or Penrhyn granite; see GRANITE (p. 71, etc.).

STITHY; see STIDDIE. An anvil.

STOA (Gr.). The term used where the columns in the front of a temple are so much in advance as to have a column on the return side between the edifice and the columns in advance; WILKINS, *Prolusiones*, 4to, London, 1837, p. 18. The building at Athens called by STUART, *Athens*, fol., London, 1794; and edit. 1825, i, 67, the stoa or portico, is called the temple of Jupiter Olympius by CASSAS, *Grandes Vues*, etc., fol., Paris, 1813; and that named by STUART and others, the temple to Jupiter Olympius, is called "the Pantheon of Hadrian". The stoa at Elis called "pœcile" was also called "Echo"; it had a

ARCH. PUB. SOC.

double row of columns separated by a long wall; PAUSANIAS, vi, 24; v, 21. **PECILE** or **pœcile**. **PORTICUS**. **PROSTASIS**. **PRO-STYLOS**. 1. 78.

STOCK or **wimble** (Fr. *brequin* or *bile brequin*). Stock and bit; or brace and bit. A curved piece of wood into which a boring instrument called the "bit", which is of various sizes, is fitted by a brass socket and spring catch. **CENTREBIT**.

STOCKADE. A wall formed by planting upright in the ground squared trunks of trees, or rough piles, so as to enclose an area to be defended. They are planted close together, and at intervals of three feet loopholes are cut through them, or notches a few inches long are cut down them from the top, through which the defenders may direct a fire of musketry on the assailants. **PALISADE**. 14.

STOCK BRICK. The ordinary make of London brickyards. In 1736 it was stated that *place* bricks were generally made in the eastern part of Sussex, and as soon as moulded were laid down singly on their sides in ricks or rows until stiff enough to be turned on their edges and drest: while *Stock* bricks were made of better earth, and on a stock, i.e., the mould was put on a "stock" after the manner of tile making, and when one brick was moulded it was laid on a board somewhat larger than itself, and so continued, and then all taken to the hack, and placed on edge leaving the thickness of the board between each; hence perhaps the term. Stocks and place bricks now only differ from their place in the clamp, being made of the same earth. "Stocks are hard-burned bricks, fairly sound, but more blemished than *shippers*; they are used for the principal mass of ordinary good work. *Hard stocks* are overburnt bricks, sound, but considerably blemished both in form and colour. They are used for ordinary pavings, footings, and in the body of thick walls; *grizle* and *place* are underburnt bricks. There are malm bright stocks; washed stocks, and hard stocks; common and rough stocks"; *Notes on Building Construction*, 8vo., London, 1879, iii, 105. The better sort are *malms* and *cutters*; and *seconds* for house-fronts; *yellow malms* for fronts; **BRICK** (p. 138; 140). The acts of parliament, 1725 and 1729, naming grey stocks, etc., are quoted s. v. **PLACE BRICK**. 1736 stock bricks were used for paving, thirty made according to the statute 9 by 4½ by 2¼ ins., equal a square yard. "Grey stock" and "red stock" bricks are next to place bricks; the first are used chiefly for to face the fronts of buildings either entirely of themselves, or mixed with "red stocks", commonly called rubbed and gauged work, as in the arches to the heads of windows, fascias, rustic quoins, etc.; **LANGLEY**, *London Prices*, 8vo., 1750, p. 5. When neatly laid four courses seldom exceeded 11 ins. in height. 1767 Grey stocks were "the standard brick"; they were used in the better kinds of plain work; the better ones in arches; the others in walling; they were also cheaper than the red stocks. Those in the front of the duke of Norfolk's house in St. James's square were from his estate in Norfolk, without being better than those of London; **WARE**, *Body of Arch.*, fol., Lond., 1767, p. 60-1. **SUFFOLK BRICK**. 4.

STOCKETT (LEWIS). July 1568, as surveyor certified certain works for the state (**ROLLS OFFICE**, *Calendars*, p. 311); succeeded J. Ravile or Revell; and was 1570 surveyor of the works to queen Elizabeth; had an ordinary allowance of £1,200 per annum for repairs to her palaces; Dec. 1573 was paid £500 to provide building materials (*idem*, p. 470); and was succeeded 1581-2 by T. Graves.

STOCKHOLM (Lat. *Hohnia*; It. *Stoccolma*; Sp. *Estocolma*; Ger. *Stockholmen*). The capital of Sweden, situated on the channel conveying the waters of the lake Mälarn to the sea. It is built partly on the mainland and partly on nine holmen or islands. Among the many bridges are:—Nyanorrbron or new stone bridge from the Stadenholm to the Norrmalm after a design by Tessin, is 640 ft. long by 64 ft. wide; two drawbridges to the Södermalm; of stone to the Riddarholmen; of iron 550 ft. to Skeppsholmen. The Kastellholmen has a strong fortification to defend the entrance of the harbour which will contain the largest vessels. The citadel was 1260 built by Birger jarl on

the Stadenholmen in the centre of the town; on its site is built the palace planned 1695 by J. de Lavallée, burnt 1697-8; rebuilt from 1692 or 1703 by count N. Tessin, who dying in 1728 it was continued by his son C. G. Tessin for thirteen years more; continued by baron C. F. von Hårlemann who designed the east wing and interior; in 1753 it was occupied by the royal family; the roof is of sheet copper $\frac{1}{2}$ in. thick. It contains a museum, library added 1877, gallery of pictures and sculpture (ILLUSTRATED LONDON NEWS, iv, April 27, 1844). It is of granite below and red brick above. On Norrmalm are the best dwellings and shops, with several good squares and streets; and on Blasieholmen are fine buildings.

The S. Nicolai church, the cathedral, also called "storkyrkan" or head church, dates from 1260. S. Gertrude now the German church has a spire 222 ft. high and has the only peal of bells. S. James has a south portico 1644 sculptured. S. Clara 1285; rebuilt 1751, its interior is the handsomest in the town; the altar-piece by Sergel; tower 332 ft. high. The Riddarhuskyrken, the old Gothic church of Riddarholmen, with chapels of late date, where distinguished personages are buried; and captured flags are deposited: it has numerous small domes; the spire destroyed by lightning 1835 was re-formed of perforated cast iron 302 ft. high. Maria Magdalen church, planned *cir.* 1650 by S. de Lavallée; who also designed S. Catharina church, burnt 1723, rebuilt by Adlercrantz, Greek cross, and of good proportion, octagon tower and dome. Church of Adolphus Frederick (1751-71), a Greek cross having a centre octagonal tower with a copper dome. That of Ulrique Eleanor is somewhat similar. The Minoriten church 1289 by C. or H. Scheinpfel or Schimpfepfel. S. Hedwig Eleanor. S. Eugenie cathedral church partly fell 25 May 1866 while being enlarged and was nearly all destroyed. English Episcopal church of SS. Peter and Sigfrid, 1863-6, Gothic with spire (BUILDER JOURNAL, xxi, 124).

Among the public buildings are, the national museum 1850-68 by A. Ståler. Post office; Ofver stathallershuss or governor's residence by — Tessin. Exchange 1776; and Custom house 1788 by Palmstedt. Observatory *cir.* 1750 by C. von Hoerlemann. Marieberg, formerly a porcelain factory now school of artillery. Radhus or town hall, a large pile containing courts of justice. Danviken or great hospital. Riddarhus or palace of the order of nobility or parliament house, 1648-80 by S. de Lavallée and his son John; having shields of about 3,000 Swedish nobles. Prince Oscar's palace. The Johansdal formerly Rosendal, for Charles John XIV (1818-44), where is the porphyry vase in three blocks, 12 ft. diam., 9 ft. high, from Elfdal in Dalecarlia. The old palace on Riddarholmen. The admiralty and its church. On Helgeandsholm is the royal stables for 146 horses. The royal theatre or opera house; Dramatic theatre 1842; southern theatre on the Mosebacke for 600 persons, with hotel, assembly rooms, etc., which is well situated. 14. 28. 50. 96.

In the environs are the royal residences: Of Ulriksdal built by Hedvig Eleonora, widow (1660) of Charles X; richly decorated by Charles XV (1859-72). Haga palace for Gustavus III (1771-92). Karlsberg for Charles XII (1696-1718), since 1792 a military college. Gripsholm, a monastic settlement 1380, occupied by Gustavus Wasa I (1523-60) (and III 1771-92), who built palace and castle; it has now a collection of some 1,800 portraits. Drottningholm by — Tessin of great beauty with collections of pictures, coins, etc., in later half of XVII cent. Svartsjö formerly a Carthusian convent, then a castle for Gustavus Wasa (1523-60), and rebuilt. Rosenberg for Charles XIV (1818-44).

Map No. 205 in Society for the Diffusion of Useful Knowledge, Atlas. PABAN, *Promenades dans Stockholm*, 8vo., St., 1842. ATKINSON, *Art Tour to Northern Capitals*, 8vo., 1873, p. 103. BRENNER, *Denmark, etc.*, 8vo., 1840, ii, 341. ILLUSTRATED LONDON NEWS, view of Admiralty, 1844, iv, 179; and palace, 272.

STOCKHOLM GRANITE. The Hufvudsta quarries give the general building stone of Stockholm; which is of a fine clear grey colour, very solid and durable, and obtainable of almost any size, and at a moderate price. SWEDISH QUARRIES.

STOCKHOLM TIMBER; see BALTIC TIMBER and FR. Stockholm joinery warehouse 1877 for doors, windows, mouldings, skirtings, etc.; wooden houses; Swedish trellis in yellow wood planed.

STOCK LOCK. A rim lock. The term is now applied to locks having cases of wood for outside use. 1365-6, "eighteen stokloks"; BRAYLEY, *Westminster Palace*, 8vo., 1836, p. 192. 1419, "stoklok", SURTEES SOCIETY, *York Fabric Rolls*, 8vo., 1859, p. 355. 1736, "plain S-bitted stock locks and S-bitted and warded stock lock", are mentioned; also "plate stock lock, and plate stock lock in shute". The outside and inside of one with key, *cir.* 1580 from a church in Kent, is given in *Journal of the CLERKS of WORKS ASSOCIATION*, July 1886, p. 784. 4.

STOCKS and whipping-post. These belonged to the parish for punishment of offenders. A pair of stocks is to be seen in Stone church, Isle of Oxney, Kent, which used to be placed outside the churchyard at the south-east corner. Another at Brading, Isle of Wight, at the town hall. Both still (1882) remain at Forthampton, Worcestershire. An example was exhibited in "Old London" in the Exhibitions of 1885-6 at South Kensington.

STOITHES. A name 1532 for timber as cut up, "stoys, ponychys, geysts, and stoithes"; SURTEES SOCIETY, *Finchale Priory*, 8vo., 1837. STOOTHS of York, *Fabric Rolls*.

STOKE, *senr.* and *junr.*; practised at Newcastle-on-Tyne early in this century; BUILDER JOURNAL, 1859, xvii, 293.

STOKEHOLE (Lat. Hypocaust; *præfurnium*; Fr. *chaufferie*). The place or pit from which the fire of a furnace is "stoked" or supplied with fuel.

STOLE. An old orthography of stall and stool. 1512, "stolying of the church, 6s. 8d."; five other entries to 1520, supposed to refer to the seats or pews; HAWES, *Framlingham*, 4to., Woodb., 1798, p. 291. BLOMEFIELD, *Norfolk*, 8vo., 1805-10, iii, 511-2.

STOKE GROUND BATH STONE. This named stone was brought to London about 1866-8. It can be obtained of any depth in bed; an advantage as Bath stones must be so placed. Nearly all the outside dressings, etc., the columns in one length of the portico to the garden front of the house at Kensington built for baron Grant in 1860, had stones standing on their natural bed. Pictor and Sons state that this stone may be used for the less exposed parts of a building and for interior purposes, being when dry a fair weather stone. Isaac Sumsion gives its crushing weight as 104 tons per square foot, as compared with 188 tons for Monk's park, Corsham.

STONE. A natural indurated substance usually obtained under the surface of the earth, and worked in a quarry. Its strength and durability have induced its employment for building purposes, in a greater or less degree, by every nation of the world. It varies greatly in quality and component parts, from the softest sandstones to the hardest granites. The qualities requisite for a BUILDING STONE are hardness, tenacity, and compactness. The hardest stone has not always the greatest tenacity or toughness, for limestone, though much softer, is not so easily broken as glass. It must be firm enough to sustain great pressure, and yet so aggregated as to admit of being worked with facility by ordinary tools, and of receiving correct surfaces in any direction. In general, it must yield masses in great dimensions. Its colour is often of importance, and this colour is modified in buildings by the growth of lichen, the access of moisture, and the change of oxidation of contained iron. Generally speaking, sandstones are least absorbent, magnesian limestones least disintegrating, sandstones appear to be strongest, though choice magnesian limestones (as of Bolsover) are fully equal in this respect, and almost as little absorbent; *Report of the Commissioners*, 1837.

Thinly laminated limestone, possesses different degrees of strength according to its position. If placed on edge it has less resistance and strength than when placed on its bed. Dark stones are generally the strongest. Those which suck up much water are bad. Those with brilliant points and hard are good. A good criterion is the sound of the stone when struck with a metal instrument; when a full sound is given out it is a proof of a

good stone. Those in which sulphur is present are generally hard and good, but require care in the selection. Heavy stones are good as denoting compactness of structure. Evil arises from an imperfect character of stone. Granite stands fire badly; limestone heated in a fire, by the application of water is disintegrated and falls into lime. Stone should be free from flaws, shakes, vents, or other defects. A test for the quality of a stone is crown glass; if the stone will scratch it, it is a sandstone; if not, a limestone.

The names of the stones or quarries included in this work have not been collected. Various terms for stones are to be found in old building Accounts, as "gobetts, urnell, rag, grofts, sextefothers, doubles", etc., which are plainly local, and apply to the quarries whence they are brought, or to the rough shapes of them, rather than to their office in the structures; WILLIS, *Nomenclature*, 25.

ALABASTER. BASALT. BLACK. BRECCIA. CHESHIRE SANDSTONE. DOLOMITE. FREESTONE. FIRE STONE. GRANITE. GREENSTONE. LIMESTONE. MAGNESIAN LIMESTONE. MARBLE. MILLSTONE GRIT. OLD and NEW RED SANDSTONE. OOLITE. PORPHYRY. RATCHELL. RED. ROUGH STONE. SANDSTONE. SERPENTINE. SLICEOUS. WHITE. YORK STONE.

ARTIFICIAL. BARFF'S PATENT. BRARD'S PROCESS. CONCRETE STONE. RANSOME'S. SILICATED STONE.

ABSORPTION. ATMOSPHERIC INFLUENCE. DECAY. FROST. HARDENING. INDURATION. LICHEN. PRESERVATION. BED. GEOLOGY. LITHOLOGY. PAVEMENT. QUARRY.

PHILOSOPHICAL TRANSACTIONS, *Directions for Inquiries concerning Stones and other Materials for the use of Building*, 1673; p. 6010. HUNT, *Tudor Architecture* (prejudice which existed against English stones), 4to., 1830, p. 28. BAKEWELL, *On the Application of Mineralogical and Chemical Science to the selection of Stone for the purpose of Durable Architecture*, n.d. *Report on Fitness of Stone used for Building purposes for the new Houses of Parliament*, fol., 1837; reprinted 1845; in GWILT, *Encyc. of Architecture*, edits. 1867 and 1876; also in SPON'S *Architect's, Builder's, etc., Pocket Book*, 12mo., 1876 and later years. "Mineral Products", Class 1, *Building Stones of England*, in Exhibition of Industry 1851, *BUILDER Journal*, 1851, ix, 587, 605, 639, 685, 715, 747. *Mineral Statistics of the United Kingdom*, etc., part 2 for 1858 by R. HUNT, 8vo., 1860, in *Memoirs of the GEOLOGICAL SURVEY OF GREAT BRITAIN*. ANSTED, *Building Stones*, *BUILDER Journal*, 1847, v, 564. BURNELL, *On Building Stones; the Cause of their Decay and the Means of preventing it*, read at Roy. Inst. of Brit. Architects, 1860; *idem*, xviii, 133, 147. BURNELL, *Choice of the Building Material for the Southern Embankment*, July 1865, in *PRACTICAL MECHANICS' JOURNAL*; and *ILLUSTRATED BUILDER'S JOURNAL*. PAIN, *Selection and Use of Stones for Engineering and Architectural Purposes*, *BUILDING News Journal*, 1871, xx, 403. *Catalogues of the Exhibitions of 1851 and 1862*, etc. HULL, *Treatise on the Building and Ornamental Stones of Great Britain and Foreign Countries*; 8vo., 1873. *Our Stone Quarries*, etc., in vol. 50 of *BUILDER Journal*, from 13 March 1886 *passim*, gives valuable information.

1. 4. 14. 19.

England.—*Building Stones used in London*, *BUILDER Journal*, 1858, xvi, 632, by W. Papworth. *Principal Stones for Building in the Metropolis*, *BUILDING NEWS Journal*, 1869, xvi.

Building Stones of Scotland, *BUILDER Journal*, 1876, xxxiv, 311, read by GEIKIE at Edinburgh Arch. Assoc. *On the Use of Building Stones*, by GOWANS, read at ditto; *idem*, 1883, xlv, 87. ADIE, *Transactions of Royal Society of Edinburgh*.

Ireland.—WILKINSON, *Geology*, etc., 8vo., London, 1845.

United States.—The United States census bureau undertook to collect information relating to quarries of building and other kinds of stone in all parts of the country. The location and extent of the stone, the amount of capital employed, the annual output, methods of quarrying and dressing, number of hands employed and wages paid, methods of transport and their cost, structures of all sorts made of each sort of stone,

and so on. Duplicate samples of rough rock in the shape of four-inch cubes are being got from each quarry for examination. One object is to ascertain how each stone will act under different conditions as to temperature, etc. A stone which answers for building purposes in Florida quite fails in New York, and *vice versa*. Those granite blocks which are apparently indestructible and which are so valuable a building stone in New York would soon rot in the Florida climate. Portland (U.S.A.) sandstone when quarried and set on edge, as it is in the walls of so many buildings in New York, will in a few years begin to scale off and give the building a ragged appearance. Samples of rock (a kind of sandstone) received from the only quarry in Florida, on analysis showed that it contained about 16 per cent. of phosphoric acid, so that it is more valuable as a fertiliser than as a building stone. Quincy granite under the microscope is seen to be full of pentagonal cells containing air and water; under the action of heat the water is converted into steam and bursts the stone; hence its tendency to fly in a fire. Sandstones and limestones which have been used for foundation, or wall of some rough structure, have been smoothed and polished, and found suitable for the most elaborate work. The information was printed in *Report on the Building Stones of the United States, and Statistics of the Quarry Industry for 1880*, 4to., 1883. DUNLAP, *Rise and Progress of Arts of Design*, 8vo., New York, 1834, p. 467. MAHAN, *Civil Engineering*, 4to., 1845. BURNHAM, *Limestones and Marbles, History and Uses*, 8vo., Boston, 1883.

France.—*Report on Stones used in Paris in 1678*; DALY, *Revue Générale*, 1852, x, 194, 274, 322. At Blois, Report in 1680; *idem*, xvi, 131, 174. *Stoneyard of France*, *BUILDING NEWS Journal*, 1879, xxxvi, 591.

India.—*BUILDING NEWS Journal*, 1873, xxiv, 448.

Egypt.—EGYPTIAN ARCHITECTURE. SYENITE. GRANITE.

Australia.—*BUILDING NEWS Journal*, v, 671; *BUILDER Journal*, xviii, 579.

New Zealand.—*BUILDING NEWS Journal*, 1865, xii, 60.

Italy.—Collatino (red), Gabino (tawny), Lavagna, Peperino (common), Pumice (volcanic), Puzzuolana, Sperone (grey), Tiburtine, Travertine, Tufo (volcanic).

Sweden.—GRANITE. *BUILDING NEWS Journal*, 1867, xiv, 490.

Fracture and Crush; Lateral strength or strain. *Transactions of INSTITUTION OF CIVIL ENGINEERS*, i. *BUILDING NEWS Journal*, 1873, xxiv, 168; 633. MAHAN, *Civil Engineering*, 4to., 1845, p. 28; 143. *ARCHITECT Journal*, 1849, ii, 329. CIVIL ENGINEER, etc., *Journal*, xiii, 269. *Expansibility*, CIVIL ENGINEER, etc., *Journal*, 1838, i, 75. *Weights of Building Stones in most general use*, by C. H. SMITH, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1859-60, p. 173-6. STRENGTH OF MATERIALS.

STONE; LARGE, as set in ancient and modern buildings, as at Baalbec; and in Cyclopean and Pelasgic construction; so called Druidical and other remains, referred to in MONOLITH.

STONE (EDWARD), the first clerk of the city's works, April 21, 1477; *BUILDER Journal*, 1863, xxi, 782.

STONE (FRANK), for upwards of thirty years county surveyor at Norwich; and 1805 a member of the Norwich Society of Artists, first exhibition. 1818 he designed the new gaol at Great Yarmouth (DRUEY, *Gt. Yarmouth*, 8vo., London, 1826, p. 76); 1818 made repairs to the west front of Norwich cathedral; *cir.* 1829 repaired the east front of the castle by rebuilding a large central portion up to the battlements; and further works from 1834 to his death, 22 August 1835 at Norwich. A. Salvin succeeded him up to 1838 at the castle. *BUILDER Journal*, 1861, xix, 467. NORWICH.

STONE (NICHOLAS), "statuary, and tombe maker, master mason and architect," born 1586 at Woodbury, near Exeter, became a pupil of Isaac James for three years in London; then of H. van Keyser at Amsterdam, for whom he designed the façade of the Westernkerke, and whose daughter he married, her portion being paid in stone as Keyser held great part of the quarry in the isle of Portland. Returning 1614 to England he was largely employed on "statues, tombs, effigies or picters, dials,

fountains, chimney pieces", etc., which are here omitted; and worked with B. Jansen, mason. In July 1616 he went to Scotland to do work in the king's chapel, king's closet, and the organ, "for £450 of wainscot work with £50 for drink money". 1619-22 as master mason, he built the banqueting house at Whitehall, from the design of I. Jones; and was paid 4s. 10d. per day. 1624 (?) the gateway designed by I. Jones, on east side of and near to Holland house, Kensington, now removed to another site. 1626 watergate at York stairs, Buckingham street (considered to be designed by I. Jones); 1626 April 20, was appointed by king Charles I "master mason and architect at Windsor castle for his life at 1s. per day, as William Suthis had" (grant in RYMER, *Fœdera*, xviii, 675; not mentioned in TIGHE AND DAVIS, *Annals of Windsor*, 8vo., 1858). 1632 porch to Stanmore church, Middlesex. 1632 gateway and stone wall to the Physic garden, Oxford, from I. Jones's design. 1632 designed Cornbury, Oxford, for lord Cornbury (V. STRONG). 1633 built the portico of twelve Corinthian columns to the west front of old S. Paul's cathedral, 200 ft. long, 40 ft. high, and 50 ft. deep, from I. Jones's design. 1634 received "a rondlett of Canarie wine (28s.)" as recompense for his advice at Allhallows Barking church. 1635 designed and estimated for several works at Windsor castle (not all carried out) in rebuilding the banqueting house at east end of the north terrace; a new wall and gateway leading into the little park; removing the costly "sesterne" erected by queen Mary in the upper ward, and placing a new fountain there; and making a way for the king from the castle to the cloisters. 1637 porch of spiral columns to S. Mary's church, Oxford (also attributed to Hans Holbein and I. Jones). Lastly, 1638 Tart hall, "without the gate of S. James's park, near Buckingham house", for Alatheia, countess of Pembroke. He suffered in the civil wars. His portrait with that of Nicholas, his second son, is given in WALPOLE, *Anecdotes*. He died 24 August 1647, aged 61, and was buried near the pulpit in the church of S. Martin-in-the-fields; his wife died 19 November; and Nicholas 17 September, who were buried in same grave. An "account book of some of the Woorkes 1631-42 in England, Holland, and Scotland", drawn up by his nephew C. Stoakes, is in sir John Soane's museum; portions were printed in BUILDER *Journal*, 1854, xii, 252, 337, 359; and many others from another book, in WALPOLE, *Anecdotes*, who gives many pages to Stone. British Museum *Add. MS.* 5830f, 73b; and 6193, p. 26-7, 119. 14. 19.

HENRY, the eldest son, who was a good painter, with JOHN, the third son, carried on the business of statuary in his father's premises on south side of Long Acre; he travelled 1639-42 with NICHOLAS; and wrote *The Third Part of the Art of Painting*, died 24 August 1653, and was buried near his father, with a tomb erected by John. NICHOLAS, the second son, went to Italy, studied under Bernini, became a good statuary, returned May 1642, published *Enchiridion on Fortification*, 8vo., Oxfr., 1645, and died in 1647; *Journal in Italy*, Harl. MS. 4049. JOHN, the third son, went to France, returned and became engaged with Henry. On 11 June 1660 he petitioned the king "for the place of mason and architect to H.M., enjoyed by his late father who had £1,000 due to him for work done, and was plundered and imprisoned for loyalty; served the late king at his own cost, and armed a man." Aug. grant to John of office of master mason of Windsor castle, fee 12d. a day; *Calendars of State Papers*, s. d., p. 48, 210. It is said he sold the grant to Edward or Joshua MARSHALL; and dying in , was buried in the same church; perhaps in 1696 in which year "their near kinsman Charles Stoakes" repaired the father's monument; BUILDER *Journal*, 1859, xvii, 647.

STONE ARCH; see ARCH; BRIDGE; CATENARIAN ARCH; STONE BRIDGE.

STONE AXE; see BREITURE. DIAMOND HAMMER. JEDDING AXE, SCABBLING HAMMER or CAVIL.

STONE BASE OR SEAT. "The chancel of S. Mary's church, at Stow, has been assigned to Remigius by Rev. G. ATKINSON (vol. i,

p. 315), being induced to hold that opinion from the stone base or seating, and the arcade above it, which runs round its eastern as well as its northern and southern walls. This he conceived to be necessary for conventual use, and thought it very likely that when Remigius ejected the Saxon monks and introduced Benedictine regulars in their place, he would provide such seating as that still existing for their use; but that after 1109 when these Benedictines in their turn were removed by bishop Bloet to Eynsham, such a mode of seating and such arcading would be unnecessary. The many instances of such seating and arcade work found in churches which never were monastic prove that such an hypothesis was founded on insecure ground. It may date of the time of Alexander 1123-74," ASSOCIATED SOCIETIES, *Reports and Papers*, 1866, p. 248. Another author remarks, "The presumption is, that where a plain seat runs round the chancel, the church was entirely in the hands of the parochial clergy." "A stone seat is in some cases continued all round the walls of the apse and its chapels inside and out"; STREET, *Churches of Auvergne*, in Roy. Inst. of Brit. Architects, *Sessional Papers*, 1860-61, p. 111. BENCH. BENCH TABLE. CARRELL. SEDILIA. STALL.

STONE BLUE, powder blue, or common starch blue is a smalt; also called azure.

STONE BRICK, patent, 1864 by Bodmer bros. of sand and lime, or lime and blast-furnace scorie, slag or cinders, ground to powder.

STONE BRIDGE. There is perhaps no list of the several particulars of stone bridges; reference can be made to each of the cities in this work. A list of *Great Spans of Railway Bridges* is given in BUILDER *Journal*, Dec. 1859, xvii, 828, from THE ENGINEER *Journal*; and *Long Span Bridges*, from *Journal of the FRANKLIN INSTITUTE*, B. J., 1869, xxvii, 683. *Modern Bridges of France*, in CIVIL ENGINEER *Journal*, 1857, xx, 147. To the general publications given s. v. Arch, and Bridge, the following are added. GAUTIER, *Traité des Ponts,—des Romains et Modernes*, 8vo., Paris, 1716; new edit., 1728. PITROU, *Recueil de diff. Projets d'Arch.*, etc.,—*Constr. des Ponts*,—rédigés par le Sr. TARDIF, fol., Paris, 1756. RONDELET, *Short Principles*, etc., *Thickness of Pier and Height and Base of Arch*, transl. by RIOT, 8vo., 1760; 1770 HUTTON, *Principles of Bridges*, 8vo., 1772; 1801. PERRONET, *Projets, etc., des Ponts de Neuilly, etc.*, fol., Paris, 1782-9. PERRONET, *Mémoire—employer pour construire de grandes Arches de Pierre de deux cents, 4to.*, 1793. MILNE, *Principles of Bridges and Piers*, 8vo., 1806. SAVAGE, *Essay on Bridge Building*, 8vo., 1808. WIEBECKING, *Traité—de la Science des construire des Ponts*, 4to. and fol., Munich, 1810. HUTTON, *Theory of Bridges*, 8vo., 1812. GIRAL, *Sur les Constructions des Ponts*. CORDIER, *Const. des Routes, des Ponts, etc.*, 8vo., Lille, 1823-8. RONDELET, *Traité théorique, etc., de l'Art de Bâtir*, fol., 1835, 6th edit., Supp. by BLOUET, fol., 1848. SGANZIN, *Cours de Construction, etc., des Ponts et Chaussées*, edit. by REIBELL, 4to. and fol., Paris, 1839-41, 4th edit. GAUTHY, *General Principles—Construction of Bridges—determine the Dimensions of their several parts*, transl. in HANN AND HOSKING, *Bridges*, 8vo., 1843. BLAIR AND PHILLIPS, *The Construction of Viaducts, Bridges, etc.*, 8vo., 1845. TELFORD, in EDINBURGH ENCYCLOPEDIA; extracted in NICHOLSON, *Dict. of Architecture*. TELFORD, *Tables of Proportions of Highland Bridges*, given in HASKOLL, *Assistant Eng.*, etc., *Guide*, 8vo., 1848, pt. 2, p. 145; with tables of dimensions for several sorts of Arches, etc. HAUPT, *General Theory of Bridge Construction*, etc., 8vo., New York, 1851. DUGGAN, *Bridges of the United States*, fol., 1850. ROY, *Essai d'Arch. Pratique de Const. des Ponts, etc., en Maçonnerie*, 8vo. ABBOTT, *Permanent Bridges for Indian Rivers*, 8vo., 1850. GROVER, *Est. and Diagrams for Railway Bridges and Culverts*, 4to., 1866; 1870. HASKOLL, *Bridges, etc.*, 4to., 1863-4; *Examples of Bridges and Viaducts*, 4to., 1868; *Railway Construction*, 4to., 1863. WARR, *Dynamics*, etc., 8vo., 1851. MOSELEY, *Mechanics applied to the Arts*, 8vo., 1852, 3rd edit. ENCYCLOPEDIA BRITANNICA, 1876, s. v. Bridge, is perhaps the last complete work on the subject.

STONE COLOUR. A vague term often used in specifications when describing paint to be done in outside work. Grey stone; Brown stone; Fawn or Portland stone. **STONE OCHRE.**

STONE CUTTER. The term applied to the man who shaped and incised the Runic crosses. The term *Chatainpiera*, 1384 occurs on tomb at Venice; RUSKIN, *Stones*, 8vo., 1851-3, iii, 82. A "stone cutter", it has been stated, presented to a church, at laying the first stone, his services free for two years. 1358 Edward Canon, "master stone cutter" working the stalls of S. Stephen's, Westminster, at 18d. per day. The stone cutter, in Dublin 1864, was not allowed to set stone, nor were the masons, because they were only stone masons. **CEMENTARIUS. LAPICIDA. MASON. SCULPTOR. STATUARY. TAIPIERA.**

STONE CUTTING; see **STEREOTOMY. STONE-WORKING MACHINERY.**

STONE DRESSING; see **ASHLAR. FACE. PUNCHED. BROACH. HAMMER DRESSED.**

STONE HEAP. One of many of the SEPULCHRAL MEMORIALS.

STONEHENGE (Sax. *stan*, stone, and *heng* or *hang*, hang or the horizontal stones, **PHILOLOGICAL SOCIETY**, Feb. 25, 1853, in *ATHENEUM Journal*, 19th March). An assemblage of large stones now in various positions situated on Salisbury plain, two miles from Amesbury, Wiltshire, and formerly considered to be connected with Druidical ceremonies. There is a profusion of barrows and earthworks on the surrounding plain; the avenue, and the "cursus". As to its date of erection:—NENNIVS, ix cent., states the murder by the Saxon Hengist (hence "stan hengist") of 460 nobles in the latter part of v cent., and attributes the erection by the surviving Britons. GEOFFREY of Monmouth, xii cent. gives a similar account and that the stones were removed from Kildare in Ireland, having been conveyed from Africa to Ireland. GIRALDUS CAMBRENSIS 1187 had seen a similar monument near Kildare. FERGUSSON, p. 173, considers it was erected by Eumrys or Aurelius Ambrosius A.D. 462; his views controverted, in *BUILDER Journal*, Oct. 2, 1875. It is now generally considered to be a heathen and not a Christian work—therefore between 200 and 490 A.D. The *ARCH. JOURNAL* dates it not later than 100 B.C.; and Avebury 800 or 1000 B.C.

The space enclosed by the vallum is about 300 ft. diam. The first or outer circle of large stones is 100 or 105 ft.; each 14 ft. high; sides 7 ft. by 3 ft. The second circle of small stones 9 ft. distant is 83 ft., about 8 ft. high; within these were five sets of trilithons (each a *stonage*) in an elliptic form, 16 ft. 3 ins., 17 ft. 2 ins., and 21 ft. 6 ins. high; with three small stones in front of each, 7 ft. 6 ins. high. The large flat stone or "altar", facing the north-east, 16 ft. long, 4 ft. wide, and 20 ins. thick. The larger stones have been squared or hewn by art, and the capping stones of the outer circle are carefully attached by mortices to the uprights which have tenons: some stones are rough. It is supposed that the trilithons had other trilithons on them, "doors placed on doors" as noticed by Henry of Huntingdon, *cir.* 1130. The stones are of various qualities. **SARSEN STONE.**

JONES, *Stonehenge Restored*, fol., 1655; 1725; WEBB, *Essay*, 1664. RAY 1662 states there were 94 stones. CHARLETON, *Reflections on Stonehenge*, 8vo., 1730. STUKELEY, *Stonehenge and Avebury*, fol., 1741-3. WOOD, *Choir Gaurie or Stonehenge*, 8vo., 1747. SMITH, *Dissertation on Stonehenge*, 4to., 1771. KING, *Monimenta Antiqua*, fol., 1799-1805. MAURICE, *Indian Antiquities*, etc., 1800, vi. DAVIES, *Celtic Researches*, 1804. DAVIES, *Mythology*, etc., of the *British Druids*, 8vo., 1809. INGRAM, *Utility of the Saxon Language*, 1808. HOARE, *Ancient Wiltshire*, fol., 1812, 1818. BRITTON, *Topographical Account of Wiltshire*, 1814. BROWN, *Illustr. of Stonehenge*, 1823, 1861. HIGGINS, *Celtic Druids*, 1829. BARRY, *Cæsar and the Britons*, 8vo., 1832. DEANE, *On the Worship of the Serpent*, 2nd edit., 8vo., 1833. WEAVER, *Monimenta Antiqua*, 8vo., 1840. HERBERT, *Cyclops Christianus*, 8vo., 1849. GAILHADAUD, *Monuments*, 4to., 1842-52, i. DUDLEY, *Nuology*, 8vo., Leicester, 1846, p. 181. *Belgic Ditches and Stonehenge*, in *ARCHEOLOGICAL JOURNAL*, 8vo., 1851, p. 143-157.

ARCH. PUB. SOC.

JAMES, *Plans and Photos*, etc., 8vo., 1867. FERGUSSON, *Rule Stone Monuments*, 8vo., 1872, p. 92, names 87 stones. KAINS-JACKSON, *Our Ancient Monuments*, 4to., 1880. PETRIE, *Plans*, etc., and *Theories*, 4to., 1880. *BUILDER Journal*, 1864, xxii, p. 760, 780, 807.

STONE LIFTER; see **LEWIS. LIFTER. CRAMPOON. CRANE. DERRICK. GUY.**

STONE LIME. The harder calcareous material from which lime may be obtained by calcination; in contradistinction to the softer, as chalk; or to the crystalline, as marble. It is chiefly found in the secondary strata, under the calcareous marls, or under the clays. In the former case it yields rich or poor limes; in the latter hydraulic limes of greater or lesser power. The magnesian limestones lie next to these. The quality of limes must not be taken from the name of the locality. Most quarries have portions from which excellent lime may be obtained, and others which are worthless. In the ragstone quarries near Maidstone, are strata yielding excellent lime, which alternate with others yielding no lime at all. It seems to be generally allowed that a mixture of silica and alumina is necessary to produce hydraulic lime, which circumstance led to the invention of cements by mixing the purer limes artificially with those materials; and of rendering mortars hydraulic by using tarra and puzzolana. An excellent method of analysing a limestone, to find if it be hydraulic or not, was suggested by BERTHIER; the stone is to be finely powdered and carefully sifted; then to be treated slowly with diluted hydrochloric acid, and stirred until all effervescence ceases; the residuum is to be dried until reduced to the state of a paste; then mixed with water and filtered; on the top of this the clay or other aluminous matter will be deposited. The remainder is then to be treated with lime-water as long as any deposit takes place; the result will show the magnesia present if any, and perhaps traces of iron. In treating of limestones, the phosphates are not mentioned, as they are seldom if ever used in building; nor the sulphates, as they are described s. v. GYPSUM. Near London; lime produced from chalk, if burnt in a furnace, or flare kiln or running kiln, is called **CHALK LIME**, and is preferred for plastering. PASLEY, *Limes, Cements*, etc., 8vo., 1838; 1847, p. 21. **LIME.** * A. A.

STONE MASON; see **CEMENTARIUS. LAPICIDA. MASON. STATUARY. STONECUTTER.** *Work of the Early Stonemason*, *BUILDER Journal*, 1878, xxxvi, 229-30.

STONE MASONRY; see **MASONRY. STONE WALL.**

STONE MELTING or **LIQUID STONE.** At Kilmore, Australia, the stone on being subjected to the action of fire melts like lead. During fusion it becomes highly elastic, and on cooling presents the appearance of coke on the inside, but on the outside it retains a shining black polish. It is no doubt impregnated with bituminous matter; *BUILDER Journal*, 1857, xv, 31. **SILICA. FLEXIBLE STONE.**

STONE OCHRE. The true ochres are found in balls in the solid body of stones lying near the surface of rocks in quarries in Gloucestershire and elsewhere. It varies in colour from yellow to brown, murrey, and grey. It is of a smooth compact texture, free from grit; and may be safely used in oil or water in painting.

STONE PAPER. Messrs. Ebart of Neustadt, Elberswold, Germany, invented 1850 an incombustible cartridge paper or stone paper for roofing purposes, for tiles and thatch, as being impermeable and fireproof; *ARCHITECT Journal*, 1850, ii, 165. **PAPER (34a, 35). SHINGLES. SLATE (Artificial). PASTEBOARD ROOF. FIBROUS SLAB.**

STONE PINE; *Pinus pinea*. **SILVER FIR;** see **ABIES. PINE CONE.**

STONE PIPE. Ancient Greek aqueduct at PATARA, described by RENNIE as furnished by C. R. Cockerell, R.A.; INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1855, xiv, 206-8, and cuts. Between 1805-7 sir Geo. Wright, bart., patented machinery for manufacturing stone pipes for the conveyance of

water; it did not entirely succeed. A perspective sketch of the drill, and of the saw for cutting the stone as used by him, are in the library of the Royal Institute of British Architects. *Stone Boring*; INST. OF CIVIL ENGINEERS, *Proceedings*, ii, 146. *AQUEDUCT, Detached Essay*. For the supply of water to the city of Glasgow, TELFORD experimented upon pipes of stone; one from Rutherglen White quarry 4 ft. 9 ins. long, 18½ ins. square, with a bore of 9½ ins. diam.; subjected to a pressure of a column of water 60 to 80 ft. high it split in the direction of the natural bed. Another stone 5 ft. 2 ins. long, 13 ins. square, and 4½ ins. bore, did not emit water until a 100 ft. head; and split when a little over 300 ft. head. One of Portland stone 4 ft. 6 ins. long, 12 ins. diam., and 6 ins. bore, did not emit water nor had any symptom of fracture under a head of 350 ft. Other stones showed such varying results that Telford could only recommend iron pipes for use; INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1843, p. 136.

STONE RIB, ARCH, and GABLET, PRINCIPAL, BEAM, also STRAINING ARCH.

Minchin Hampton church, Gloucestershire; six in south transept, xiv cent.; 15 ft. wide by 29 ft. by 32 ft. high; R.I.B.A., Jan. 22, 1844; C. E. J., vii, 47. *BUILDER Journal*, 1858, xvi, 75.

Conway castle; banqueting hall; four out of eight exist. *HALL*. *Mayfield place*, Sussex. TURNER AND PARKER, *Dom. Arch.*, 8vo., 1853, ii, 292.

Ightham, Mote house. TURNER AND PARKER, *Dom. Arch.*

Finedon church, Northamptonshire, across the nave; also at Rushden church, and at Easton Mauduit in north aisle; all in *Churches of—Northampton*, 8vo., 1846-8, p. 138, 181.

Lincoln, beam between western towers; segment of an arch 262 ft. span. ROY. INST. BRIT. ARCHTS., *Transactions*, i, pt. 2.

Nismes; in church of the Jesuits; segment of an arch 565 ft. span; C. E. J., 1844, vii, 247.

Bruen Testimonial church, Carlou, 1854, by J. Derick; *BUILDER Journal*, 1854, xii, 34.

S. Miniato al Monte, near Florence; a noted example.

Barcelona, XIII cent. hall of *colegiata de Sta. Anna*; segmental arches to carry floor-beams; and over are bold pointed arches to carry the roof. Often repeated at this city (p. 296; 313). Church of *Sta. Agata*; nave; arches carrying the roof (p. 312).

Corunna; XII cent.; church of *Santiago*, nave 44 ft. wide (p. 138). STREET, *Gothic Arch. in Spain*, 8vo., 1865.

Stone slabs supported by stone ribs.—In co. Durham; Old Seaham; Monk Wearmouth; Boldon; and Staindrop. In New-castle-on-Tyne, S. Andrew's; Arundel in Sussex; Crofton in Yorkshire; Epworth in Lincolnshire. ALEXANDER (D.).

STONE ROOF. To the old houses in the Hauran; GRAHAM, *Exploration*, 8vo., 1858.

Ani cathedral; large flat stones. R.I.B.A., *Sessional Papers*, 1835-6, i, pt. 1, 103.

1590 Seville; difficult to put on a timber roof, and so formed it in stone; LLAGUNO, iii, 235. MINJARES. Avila; of very flat pitch; guttering as seen in the early Irish buildings (p. 168). Lerida cathedral; choir and lantern roofs (p. 354). Manresa collegiate church; nave-roof now covered with pantiles laid on the vault itself. Toledo; outer aisles and chapels of cathedral (p. 239). Barcelona; all the churches are roofless; the stone vaults being neatly and evenly covered with tiles or stones (p. 302); STREET, *Gothic Arch. of Spain*, 8vo., 1865.

Milan cathedral; slabs of marble.

Mainz. Fireproof roofs of stone, the construction of which is interesting, to the west tower and all the smaller ones, after the fire of 1756. DE LASSAULX, in WILLIS, *Arch. Notes*, 8vo., Camb., 1842, p. 152. Churches in Auvergne; of slabs supported from the stone roofs without timber; the carved ridges are also of stone; STREET, *Churches of Le Puy en Velay*, in ROY. INST. OF BRITISH ARCHITECTS, *Sessional Papers*, 1860-61, p. 113.

Willingham, Cambridgeshire. A stone roof in imitation of one of timber, to vestry (Decor.); RICKMAN, *Attempts*, etc., 1848, p. 179. Swarby church, Lincolnshire, pyramidal stone roof to tower; ASSOCIATED SOCIETIES, *Reports and Papers*, 1882, p. xii. Woolvercott tower, Oxfordshire. Rushton, Northamptonshire,

small attached building. Glastonbury kitchen. March church; spire, gutter, and parapet, all stone and waterproof.

In Scotland; at Borthwick castle; and at Stirling. West church, vaulted aisle, flat over; East church, at east end, stone flags flat over. Roslyn chapel; BILLINGS, *Baronial Antig.*, iv.

Double stone roof, at Lincluden abbey; and New abbey. 17.

STONE ROOF TO PORCH; S. Mary's church, Nottingham; Perpend.; and Strelley in same county. Middleton Chenduit church and Chacomb church; BAKER, *Hist. of co. Northampton*, fol., London, 1822, i, 596, 655. Leverington church, Suffolk; B. J., 1848, vi, 91 and cut. Barnack (Early English).

STONESFIELD QUARRY, in the valley of Evenlode, near Woodstock, Oxfordshire, locally called Stonesfield slate, which has been wrought from a remote period. It is a calcareous slate, remarkable for the singular variety of its organic remains. It consists of two fissile beds of buff or grey oolitic limestone called "pendle", each bed is about 2 ft. thick and is separated by a bed of loose calcareo-siliceous sandstone called "race". The pendle after being quarried is exposed to a winter's frost, and the blocks being struck on their edge with a mallet freely separate into slates sufficiently thin to afford a light material for roofing.

STONE WALL; see OPUS RETICULATUM; INCERTUM; ISODOMUM; PSEUDISODOMUM; and EMPECTUM. MASONRY. RUBBLE. JOINTING. LONG AND SHORT WORK. BOND OR THROUGH STONE. ATMOSPHERIC INFLUENCE. BRICKWORK (waterproof, p. 148). CONDENSATION. DRY AREA. DECAY. DAMP. EFFLORESCENCE. PLASTERING. MOISTURE.

STONEWARE. Formerly called "delph ware". A term designating the Lambeth or other similarly made ware, and not applying generally to the Staffordshire pottery. A dense and highly vitrified material, impervious to the action of acids, capable of enduring great heat, and of peculiar strength. The ROLLS OFFICE, *Calendars* of 7 Oct. 1626, record that "stone pots, jugs, and bottles, the invention of T. Rouse alias Rees and Abr. Cullen, who should have the sole making for fourteen years," etc.; NOTES AND QUERIES *Journal*, 1868, 4th Ser., ii, 177. The manufacture of stoneware is said to have been carried on in England from 1770, but until about 1836 when the duty was taken off, this material was chiefly used for common spirit-bottles, oil-jars, etc. The clay, comprising a large quantity of silica, or of silica with iron and lime in combination, is found near the coast of Devonshire, Cornwall, and Dorsetshire, shipped to London, and when perfectly dried it is ground to a powder, mixed with water, allowed to become of uniform consistency, passed through pugmills, and taken to the workmen. In making large articles, portions of the burnt material, finely ground, are mixed with new clay; also some white sand found near Woolwich and Reigate. When thoroughly dry, the articles are placed in a kiln, subjected to a white-heat, in which state very coarse salt is thrown in and being decomposed the fumes act chemically on the surface of the ware, fusing the particles together, giving the well-known glaze. Glazed stoneware is now used for water-closet pans, syphon and gully traps, urinals, drain pipes, sewer pipes, jars of even 300 gallons, and filters. CLAY. POTTERY. KILN. GLAZE. GODDARD, *On Stoneware*, read at SOCIETY OF ARTS, *Journal*, 11-April 1860, with kiln; *BUILDER Journal*, 1860, xviii, 241; and *BUILDING NEWS Journal*, vi, 318-9; 335; *Manufacture of Stoneware*, *idem*, 1865, xii, 369. ILLUSTRATED LONDON NEWS, 1851, xix, 187.

B. A. Burton's patented improvements in the manufacture of stoneware pipes, etc., Dec. 6, 1849, are illustrated in the CIVIL ENGINEER, etc., *Journal*, xiii, 12, with a table of the relative strength of pipes made in the ordinary way and by the rolled system. The mean bursting pressure of twenty experiments on stoneware pipes conducted by B. Latham, C.E., was equal to 30 lb. per sectional square inch. The lowest result was 4 lb., and the highest 70 lb. per square inch; *BUILDING NEWS Journal*, 1873, xxv, 637. Failures (66 examples) in sewers formed of Tubular pipes in London, 1853, report by BAZALGETTE, in CIVIL

ENGINEER, ETC., *Journal*, 1854, xvi, 384-5. HAYWOOD, *Report to the Com. of City of London Sewers On Aylesford Pipes for Sewers and Drains*, BUILDING NEWS *Journal*, 1856, ii, 419. *On Pipes and Dates*, etc., BUILDER *Journal*, 1860, xviii, 268, 303.

Stanford's patent water-tight joints for stoneware pipes is explained in BUILDING NEWS *Journal*, 1874, xxvii, 238, 689; and 1875, xxviii, 29 cut, and 335. SOCKET. JOINT.

STONE-WORKING MACHINERY. A process invented to aid manual labour in cutting, carving, and polishing stone and other similar material. 1835 ROBERTSON, *Stone Planing Machine* by J. Hunter, at R.I.B.A., 27 July 1835. Hunter of Arbroath, Report of Committee on Art of Design, 1835 (?), Q, 1665; Capt. Carneggie, R.N., patentee. 1856 patent 26 Aug. by earl of Caithness; BUILDER *Journal*, 1857, xv, 224. 1860 Le Blanc, machine for cutting stones in quarries; B. J., 1860, xviii, 599. 1860 powerful stone crusher in France; B. J., xviii, 759. 1862 Hunter of Dean Forest in Wales, B. J., xx, 267, 339. 1864 Blake's patent stone breaker or ore-crushing machine, by Marsden of Leeds. 1869 Holmes' patent stone-dressing machine well described in FAMILY HERALD, 2 Oct. 1869, p. 366; B. N. J., 1869, xvi, 90. 1875 Patent stoneworking and tunnelling machinery company, limited, Nine Elms, sold May 1875. 1881 Horgate's mechanic's stonemason. 1881 Cox's patent stone-sawing machine. *Wood and Stone Carving* by Cox and son. 1885 ditto by M. Powis Bale, in TIMBER TRADES *Journal*, Feb. 1886, p. 116.

STONEY STANTON GRANITE. A syenite or hornblende rock in Leicestershire, dressed into setts for paving roadways of streets; and broken into macadam. It is of a dull brown colour, tough, and resists high crushing power. R. R. R.

STOOL. The term usually applied to a brick-moulder's workshop, though strictly it should be only applied to the table on which he works. Also the pier of some sort on which temporary buildings are sometimes erected; STADDEL, "Every house and barn in Crakehou stood upon crocks" previous to the reign of James and Charles I; WHITAKER, *Craven*, fol. 1878, 3rd edit., 528. Also a seat usually having three short legs. Pews instead of stools put up 1702 at Keighley; *idem*, 202.

STOOL PIECE; see FORM PIECE.

STOOTH, stoth, stooth, dorestoth. A thin spar of wood used in making a "stoothing" or partition of lath and plaster between rooms; as 1499, in SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durham, 1859, p. 355. DURHAM HOUSEHOLD BOOK. *Howden Roll*, 5-6 king Edward VI, *cir.* 1530. "Stoothed" is a term used in the north of England and south of Scotland for battening with plaster over, as "quartering"; also "stouthing and warping". STOUTHES of *Finchale Priory*. 1.

STOP. The term for the finish at top and bottom of a CHAMFER, as used in mediæval architecture; also called a STINT. Also (Fr. *engorgement*) the choke of a pipe. Also, a small block of wood, or a buffer, so fixed as to prevent a door being opened full back.

STOPCOCK. A means of turning off water or gas in pipes for low and high pressure. A BIBCOCK is only used for water. A fourway stopcock is described in ASHPITEL, *Baths*, etc., 8vo., 1853, p. 42. A "screw slide valve" by Newton of Sheffield, for heating apparatus.

STOPPING. The act of filling up holes or defects in various materials, as in woodwork, by painters before painting, who use oil putty sometimes stained. Glaziers have a "stopping knife" for putting in a pane of glass. It is also the material itself. Frames should be bedded and pointed in mastic cement in preference to hair mortar, which cracks and falls out with concussions. In metal work, small holes or defects in castings are often filled up with a composition called "beaumontague", to conceal flaws, as was explained during the Tay bridge disaster of 1879. "Spence's metal" is more generally used in workshops for such a purpose. SANDHOLE. To stop leaks in gutters, see SOLDERING. LEAKAGE. IRON CEMENT. "Stopping and picking-out tools" are used by the plasterer in repairing cracks. 1.

STORA; see PHILIPVILLE, in Algeria; cisterns and aqueducts.

STORAGE RESERVOIR; see RESERVOIR. RAINWATER TANK.

STORE. A term used early in America for a shop where nearly everything is sold, or one specialité on an extensive scale, wholesale and retail. In Dublin they are called "Scotch houses". At Philadelphia, BUILDER *Journal*, 1854, xii, 215. At New York, *idem*, 1863, xxi, 870. On the Broadway in New York, 1876, is a structure of marble occupying the square bounded by Ninth and Tenth streets and Fourth avenue; Stewart's palatial dry-goods store, where everything from ladies' hairpins to carpets can be gained, probably the largest establishment of the kind in the world; its eight floors, on a level, would cover fifteen acres.

STOREHOUSE (Lat. pars *Fructuaria* of a villa, having the various places where produce of a farm was stored). Iron roof over the magazine or warehouse of the Providence ironworks, at Paris, by L. Marquet, ALLGEMEINE BAUZEITUNG, 1854, pl. 635; and CIVIL ENGINEER, ETC., *Journal*, 1854, xvii, 425, 463. In Russia; magazines, granaries, etc., RUSCA, *Recueil des Dessins*, fol. 1810, H, pl. 38, etc. At Woolwich arsenal 1856, for general stores; 200 ft. square, of corrugated iron and iron columns; six pairs of iron sliding doors. GRANARY. WAREHOUSE. 78.

STORE ROOM. A place where the housekeeper of a mansion keeps the stock of grocery, chandlery, and other similar articles. It must be dry, cool, and well ventilated, and perhaps warmed in winter. It should adjoin her room, and the still-room. A dresser, drawers, shelving, cupboards, and pin-rails are essentials. Where the mistress attends herself to this department, a covered sink should be provided, as well as requisites for china, glass, napery, plate, ice-making machine, etc. PANTRY. HORRAEUM. LOFT.

STORETON QUARRY; see STOURTON.

STOR HAMMER or HAMMER. The site of a town situated on the lake Miosen, in Norway, destroyed 1567 by the Swedes. The bishopric has been transferred to Opslo. There are considerable remains of the cathedral, which was nearly entire up to near the end of the XVII cent. A commencement was made 1846 to uncover the ruins of the choir, by the Association for the preservation of the Memorials of Norwegian Antiquities. ECCLESIOLOGIST *Journal*, 1848, xix, 49. NOTES and QUERIES *Journal*, Ser. 1, vi, 30. *Norge fremstillet i Tegninger*. 28.

STORM; see AERO-DYNAMICS.

STORM WINDOW. A term used in south-west of Scotland for a DORMER WINDOW, called "cripple window" in Leeds.

STORRINGE. A term used in CAMDEN SOCIETY, *Ludlow Accounts*, 4to., 1869, p. 119, as in 1564, "storrynge the lantern", and "for storrynge the steeple and leedes, 3s. 4d."

STORY or FLOOR (*historia* and *istoria* of William of Wyrcestre; Fr. *étage*; Hind. *khand*; Tod, *Annals*, 4to., 1829, iii, 761). One floor of a building. A series of apartments on one level. PALLADIO directs that the floor over the principal floor (Fr. *rez de chaussée*) be one-sixth less in height than it, an upper floor nine-twelfths of that under it. The Metropolitan Building Act 1855 gives directions as to the height of an upper story. GROUND-FLOOR. FIRST, etc., FLOOR. BASEMENT. ATTIC. CLEAR-STORY. OVER-STORY. FLAT. 19. 25.

STORY POST. The main posts at each end of a timber partition, and sometimes on each side of an opening in it. The smaller posts between them are "studs" or "quarters"; also PRICK-POST in old books on architecture. Also the upright timber supporting the ends of a girder or breast-summer under the front of a house, shed, etc. When so used, it is well to place a block, or along the front a parallel square Aberdeen, or other good granite, curb 12 ins. by 9 ins., cut out to receive the ends of the posts. TREDGOLD, *Carpentry*, 1828, p. 261, and other works, give "Tables of Scantlings" of story posts, to carry two, three, four, and five stories. STANCHEON. STUD. 1.

STORY ROD. A rod used in setting up a staircase, equal in length to the height of the story, and divided into the number of steps intended, with accuracy. 1.

STOSS or Stwosz (WIT), 1447-1533 practised in Poland.

STOUP and STOPPE (Lat. *benatura*; Fr. *benitier*; It. *pila dell'acqua santa*; Ger. *weihenscheiben*). On the right hand of the entrance-door of a church erected during the mediæval period and of those belonging to the Roman Catholic religion, is seen a basin to contain water that has been consecrated, and into which all who enter and depart dip their fingers and cross themselves. The *aspersorium* and *aquaminarium* was a vase filled with lustral water placed at the entrance of a temple. LAYER. HOLY-WATER BASIN. MUIR, *Ancient Churches of Scotland*, 8vo., 1848, p. 104, notices "that no stoup (unless the one at Uphall church, Linlithgowshire, be an exception) of Norman date is to be met with in any Scotch example". PARKER, *Glossary of Architecture*, 8vo., 1850, p. 448, names several English mediæval examples. ARCHÆOLOGIA, x, 472; xi, 365. One of the oldest examples, IX or X cent. or later, from the cathedral at Torcello, is given in SELVATICO, *Venezia*, 8vo., 1847, p. 19. In S. Giovanni Evangelista, at Pistoia, by Giovanni Pisano. SS. Giovanni e Paolo, at Venice; bronze statues by Sansovino and G. Comegna. S. Marco, at Venice. Stā. Anastasia, at Verona, two. Duomo, at Pisa, white marble. Quimper cathedral, NODIER ET TAYLOR, *Bretagne*, fol., Paris, 1845-6, ii. Rome: S. Peter's has some fine examples, the boy angels to which are the size of full-grown men. Church of S.M. sopra Minerva; LETAROUILLY, *Rome Moderne*, 4to., 1840, p. 412.

Stoup has also been defined as a post, pillar, or pedestal, to place a statue upon; WILLSON, in PUGIN, *Specimens; Gloss.* It is used in the West Riding of Yorkshire for a post; ARCHÆOLOGIA, 1814, xvii, 160. 2. 19.

STOURBRIDGE CLAY; see FIRE CLAY, which gives an analysis; one of the best clay also shows:—

Silica ...	72.516	Protoxide of manganese	1.488
Alumina ...	20.264	Phosphate of lime	1.533
Lime ...	0.891		
Peroxide of iron	3.308		100.0

The presence of lime or iron in any considerable quantities would render the clay fusible, but as the silica and alumina so greatly preponderate, it will stand any amount of heat that can be raised in ordinary furnaces. Inferior descriptions are sold as "seconds", "black", and "offal" clay. The "black" mixed in certain proportions with "seconds", potsherds, etc., is chiefly used in making crucibles. The "offal" raised in the mixed or broken state is not "picked" or selected but ground or sold at about 10s. per ton; with this the great bulk of the firebricks are made. REFRACTORY CLAY.

STOURTON STONE (sometimes written Storeton), near Birkenhead, in Cheshire. It is of the new red sandstone formation. A light cream-coloured grit from the quarries of sir Massey Stanley, at Stourton. The Stourton stone is a remarkably clear-grained variety, leading to the supposition that the grains of quartz had been well washed and cleaned before being deposited. The stone is strong and crystalline, exceedingly durable and has a good appearance as a building stone. It is used in the custom-house, corn-exchange, philharmonic hall, Baptist chapel, and numerous other buildings at Liverpool; and BIRKENHEAD. Its lateral strength is compared with other stones, etc., in ARCHITECT *Journal*, 1850, ii, 329; and CIVIL ENGINEER, etc., *Journal*, xiii, 269. A paper by J. CUNNINGHAM, *On Impressions of Drops of Rain, etc.*, was read at Geological Society; CIVIL ENGINEER, etc., *Journal*, 1839, ii, 151.

STOVE (Ger. *ofen*). An enclosed fire. It is made of iron, earthenware, or of both combined, for obtaining the largest amount of heat possible. Such is the Berlin stove used commonly in Germany. ALLGEMEINE BAUZEITUNG, 1840, pl. 360-2, gives six interior arrangements. In the 1862 Exhibition in London, various earthenware stoves were shown; in these the fuel was greatly economised by the smoke passing through various flues before it finally escaped into the chimney. The whole is thoroughly and equally heated, and as earthenware retains its heat for a long time, it has advantages over iron which becomes cold soon after the fire is extinguished.

As early as 1388 there were stoves in the royal residences at Paris, and in the galleries; some of these were called *chaffedoux*; ACKERMANN, *Repository of Arts*, 8vo., 1809, i, 302. A stove of cast iron, at Coburg, XV cent., is given in BUILDER *Journal*, 1870, July 16, p. 566. 1536, in château de chasse at Grünau, in Silesia, a *poêle* of iron, in the form of an octagonal choir. Of enamelled terra-cotta there is one in the Kaiserzimmer at Méran, in Tyrol; and in the château de Füssen, in Tyrol; HOFFSTADT, *Principes du Style Gothique*, 8vo., 1847, p. 593; HEIDELOFF, *Ornements des Mittel*, Nurnb., 1845. "L'on commence à voir à Paris des petites cheminées à l'Angloise pour des cabinets: elle sont faites de plaques de toile ou fer fondu, tant pour l'âtre et le contre cœur, que pour les costez des jambages," SAVOT, *L'Arch. Franç. des Bastimens*, 8vo., Paris, 1685, i, 142.

STOVE (Fr. *four*). The oldest mode of heating a greenhouse, etc., is by a fire with smoke flue, and on a small scale or for cheapness, it is still used, but since 1815 it has become generally superseded by the hot-water system. "Can flues" or earthen pipes are very suitable as rapidly heated and as soon cooled. For forcing or propagating there should be a separate furnace from that of the greenhouse, which is only required occasionally; LUDON, *Encyc. of Gardening*, 8vo., 1850, p. 603, etc. WILLAN, *Observations, etc.*, by the late J. Whitehurst, 4to., 1794. BARK STOVE; HOTHOUSE. CONSERVATORY. Strut stove, in HEAT, *Detached Essay*, p. 8. HOT-AIR APPARATUS. DRYING CLOSET. HYPOCAUST. BATH. POLMAISE.

STOVE or STOVE GRATE. This term for a grate set in a chimney opening, appears to be as old as WELLDON, *The Smith's Right Hand*, 8vo., London, 1765, who gives several patterns. GRATE. REGISTER. The grate must be of the simplest construction calculated by economical combustion to produce proper rarefaction within the fireplace, it should be entirely cleared from all obstruction in the form of register flaps, improperly contracted covings, etc.; then distinct chambers formed of exact capacity to allow expansion of air when rarefied, with a regular exhaustion and natural repletion, independent of any artificial means of supply from air-holes, opened doors and windows, etc. All external brickwork or brickwork exposed to excessive cold, both in building and repairing chimneys, should be worked in two thicknesses of brick with a non-conductive centre vacuity; for instance in working wyths half-brick or 4½ ins. in thickness, proper hollow bricks should be substituted for common stocks, leaving half an inch vacuity, occasionally bonded together with hoop iron in lengths of 3 ins., 4 ins., or 5 ins. placed diagonally in the mortar-joint. Chimneys of this anti-condensative construction have been recognised by act of Parliament and tested by fifty years' experience. It was found about 1848 that to give out due heat, the grate should be set low or near the hearth. REFLECTION. FLUE.

STOW (RICARDUS DE) 1195-1208 "Conventio inter priorem de Sudwerke et R. de Stow de edificanda domo in usum prioris", in British museum, Cottonian MS., Nero, C, iii, p. 187.

STOWE (RICHARD DE). In 1291-3 he erected the queen Eleanor cross at Lincoln; the tomb in the cathedral was by Dymenge de Legeri and Alexander de Abyngton; he perhaps carved the figures of the Easter sepulchre; ARCHÆOLOGIA, 1842, xxix, 182-6; ROXBURGH CLUB, *Manners, etc.*, 4to., 1841, pref., and p. 74 or 84. 1306 to perhaps 1310 Stowe was "cementarius" at Lincoln cathedral; the dean and chapter contracted with him to superintend and employ other masons to continue the central tower, the plain work by measure, and the fine carved work and images by the day; ROT. PAT., 3 Edward III.

STOWE (WILLIAM), sacrist at Evesham abbey, built about 1319 the new steeple or belfry of the church; RUDGE, *Hist. of Evesham*, p. 28. 19.

STOWELL (JOHN), "freemason", of Wells, contracted 1470 with the master of the city of Wells to make, etc., for £40, within sixteen months "all the workmanship and masonry crafts of a fronte innayge to ye alter of our Ladye" in the south aisle of S. Cuthbert church; BUILDER *Journal*, xv, 326.

STOWING BRICK. When the clamp of bricks has been formed, it is then cased with bricks already burnt, called from their different positions, the *bolt, stowing, and sneezing* bricks; and covered at top with two other courses of burnt bricks called the *cantling* and the *plattling*. BRICK (p. 140).

STOWRYS. Stakes used in building a house, in which the partitions appear to have been of wattle or wickerwork, plastered with lime; SURTEES SOCIETY, *Finchale Priory*, 4to., 1837, p. 450. STOYS is given p. 445, perhaps for "stays" or struts of timber.

STRAATEN (JAN VAN), born 31 Oct. 1781 at Utrecht, practised at Amsterdam, where he was member of the royal academy of fine arts; and founder of the society for the encouragement of architecture. He published *Plans, etc., of Various Buildings*, 10 pl., 1805; *Civil Architecture*, 1814; *Designs of Antique and Modern Structures*, 85 pl.; with other small works, including *Staircases*, after Erzey, 1829. He designed the Roman Catholic church on the Keizersgracht; two country residences at s'Graveland; another at Zeist; the large warehouses of ... Sinkel; the reading-rooms; the clubhouse called Zeemanskoop; all at Amsterdam; with many other works in various parts of the country. He was living in 1848. STRAATEN (C. van). 24.

STRACK (JOHANN HEINRICH), born 24 July 1805, at Bückeburg in Holstein; 1814 studied in the academy at Berlin; then under Schinkel, for whom he prepared drawings for the apartments of the then crown prince, afterwards Frederick William IV, in the new palace at Berlin; 1828 superintended the erection of the palaces of prince Carl, and of prince Albrecht. About 1830 or 1834 he went to Italy; and with E. MEYERHEIM through Brandenburg to measure mediæval works and with him published *Architektonische Denkmäler der Alt Mark Brandenburg*, text by Kugler, fol., Berlin, 1833-4. 1837 gained with Stüler in competition the first premium for the stations on the S. Petersburg and Paulowsk railway which they superintended. On returning to Berlin they published *Die Eisenbahnanlage von Petersb.*; and in ARCHITEKTEN VEREIN; *Architek. Album, Abfahrtsgebäude*, fol., 1838; and erected a number of private dwellings. In 1838 he was admitted royal baumeister. About 1843 with Stüler he visited France and England. Published *Altgriechische Theatergebäude*, fol., Potsdam, 1843; *Architektonische Werke*, 1855; and with STÜLER, *Vorlegeblätter für möbel Tischler*, 24 pl., 1846, being xv cent. Gothic details: *Architektonische Details*, 3 pts., fol., Berlin, 1857-58; completed at Potsdam the present imperial palace; and published with HITZIG and BORSTELL, *Der innere Ausbau von Wohngebäuden*, fol., 1856-63: completed the palace of Babelsberg, near Potsdam, and published with GOTTFREY, *Schloss Babelsberg*, fol., Berl., 1857. While at Athens 1862 he discovered the remains of the theatre of Dionysius; described in *Zeitschrift für Bauwesen* for that year. At Berlin, 1843 he designed palais Raczyński; 1846-50 the churches of S. Peter, and 1853-56 of S. Andrew; 1866-76 the national gallery; 1868 the arcades flanking the Brandenburg gate; 1871-5 the column of Victory in the Thiergarten; and the villa Borsig. At Cologne the casino; a mansion at Altona; and the tombs to Borsig and Blücher. He obtained a premium in the competition for the church of S. Nicholas at Hamburg. ROYAL INST. BRIT. ARCHITECTS, *Sessional Papers*, 1879-80, p. 221. In 1838 he was royal baumeister; in 1841 professor at the royal academy at Berlin; an Hon. and Cor. Member of the Inst. of British Architects; and architect to the emperor of Germany. He died 13 June 1880. 68.

STRADDLE; see PATTEN; STADDLE; and STOCK.

STRAETEN (JAN, or CHARLES, VAN DER), born 14 June 1771, at Bruxelles. He designed 1816 the monument on the field of battle of Waterloo (the lion was carved by van Geel); 1819-22 the pavilion of the prince d'Orange (afterwards William III) at Teroueren, later a summer residence of the duke of Brabant (p. 32); at Bruxelles restored 1822 the salles d'assemblée in the palace of the states general (designed 1779-83 by Guimard), ARCH. PUB. SOC.

later used by the senate and chamber of representatives (p. 15-7); and 1823-6 the palace of the prince d'Orange, or duke of Brabant, then of the States-general; ceded 1842 to the Belgian government; the ball-room is lined with Carrara marble, and the apartments of the duchess with Russian marble; the interior decorations were by — Suys (p. 74-6). He enlarged the king's palace: designed the hôtel of the governor of the bank; the house of the société de commerce; and a house in fossé aux Loups; the pavillon à la Harpe; château at Schiplake; hot-houses and orangeries at Leyden university; restored the mint; restored and enlarged the palace of the prince archbishop at Malines; and designed the salle des concerts at Louvain, the works were suspended 1830 and finished 1840 by him or his son. He was living in 1827. GOETGHEBUER, *Choix de Monumens*, fol., Ghent, 1827, to which work the above pages refer. STRAATEN (J. van). 68.

The son *cir.* 1835 laid out the new quarter at the station du Nord; and may have added 1849 the hall of the senate to the palace of the States-general.

STRAIGHT. A half, or more or less than half, a tile in breadth and the whole length. It usually comes in at the gable ends in every other course. 4.

STRAIGHT ARCH, or flat arch. An arch having a level upper and under edge and parallel to each other as over windows and doors. The skewback or summering is described in MOXON, *Mechanick Exercises*, 4to., 1700, p. 39, pl. 8. SMIRKE, *Obs. on the mode adopted by masons at various periods in forming a straight arch over an aperture*; ARCHÆOLOGIA, 1838, xxvii, 381. VIOLLET-LE-DUC, *Dict. Rais.*, s.v. cheminée.

A "flattened arch" such as the Tudor arch, or arch of four centres. STILTED ARCH. 4.

STRAIGHT EDGE. A perfectly level edge to a ruler or rod, whereby to test the straightness of another piece of work; or with which to draw a long straight line.

STRAIGHT JOINT FLOOR. Where the sides of the floor boards continue from one end of the apartment to the other. A FOLDED FLOOR has heading joints of three or four boards, usually once in the length of the apartment.

STRAIN, or "transverse strain or strength", or "lateral strength". The effect produced by the stress or straining force: *Stress* is the force excited in the material, or that power which, being applied externally, endeavours to produce fracture. The result of the application of a downward pressure either in the middle or some other part in the length of the timber or other material. RUPTURE. GIRDER. STRENGTH OF MATERIALS. Tables of strains have been published by various writers; they differ considerably, and the confusion is rendered worse as the teachers have not agreed upon the manner of expressing their formulas. The calculations are founded upon experiments performed on relatively small scales; the modes of calculating the constant to represent the absolute power, differ; and the relations of the safety and breaking weights, are not absolutely determined. SPENCER, *Transverse Strain of Beams*, in the CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 294; 346. INSTITUTE OF CIVIL ENGINEERS, *Proceedings*, 1854-5, xiv, 465. SHEILDS, *Strains on Structures of Iron Works*, etc., 8vo., 1861; 1867. THE ASTRONOMER ROYAL, *Strains in the Interior of Beams and Tubular Bridges*, in ATHENEUM *Journal*, 1862, Oct. 11, p. 471. HUMBER, *Strains in Girders and similar structures*, 12mo., 1868. *Stress diagrams for straight roof girders*; BUILDING NEWS *Journal*, 1869, xvi, 6, 20, 44, 58. STONEY, *Strains in Girders and similar structures*, 8vo., 1873. DIEDRICH, *Theory of Strains; construction of Bridges, Roofs, and Cranes*, 8vo., Balt., 1871. CARGILL, *Strains upon Bridge girders*, 8vo., 1873. HADFIELD, *Transverse Strains, and Application in the Construction of Building*, 8vo., 1877. RANKINE, *Applied Mechanics*, 8vo., 1868, p. 631-4. UNWIN, *Wrought Iron Bridges and Roofs*, etc., 1869.

STRAINING ARCH and **BEAM**; see STONE ARCH.

STRAINING BEAM or **SILL.** When a longitudinal beam,

as in a bridge, becomes too long for ordinary distance of supports, and is inclined to sag, a beam is put under it which is itself supported in place by a strut abutting against it at each end. Should the strut become too long and be inclined to sag, it is itself supported by an inclined clamping piece called a stirrup piece; MAHAN, *Civil Eng.*, 4to., 1845, p. 94.

STRAINING PIECE, or strutting piece. A piece of timber acting in opposition to two equal and opposite forces at its extremities for the purpose of preventing their nearer approach towards each other. Such is a principal rafter, a strut, stud, story post, etc. The horizontal beam between the heads of a queen-post truss. **BRIDGING PIECE.** 1.

STRAIT; now written **STRAIGHT**.

STRAMPFER (JOHANN GEORG), baumeister at Ulm, where 1712-8 he designed the *Teutschordenshauses*, a good work in the Italian style. 68.

STRANGER'S HALL, or house. The same as **GUEST HALL**. **HOSPITIUM.**

STRAP (*Fr. bridle*). An iron plate to assist in securing the heads and feet of two or more timbers together; each branch is bolted or keyed, with one or more bolts or keys through each timber. Thus the lower end of the principal rafter is secured to the tiebeam. Also where the end of a beam or joist passes on to the head of a post, or a plate, where one end of the strap is twisted and turned down to the back of the plate and there secured. **STIRRUP**. The iron is best heated to a blue heat and dipped in linseed oil as a preventive to rust. A strap one inch wide may be made $\frac{1}{4}$ in. thick; $1\frac{1}{2}$ in. wide, $\frac{3}{8}$ ths in. thick; 2 in. wide, $\frac{7}{16}$ ths in. thick. The ends of timbers abutting on one another were formerly morticed and tenoned and secured by one or more oak pins.

It is also the name, in one locality, for battening for lath and plaster.

STRAP WORK. A peculiar kind of ornament adopted extensively in the xv and xvi centuries, especially in Flanders and Germany, as a general decorative enrichment. It consists of a narrow fillet or band, folded and crossed, and sometimes interlaced with another. A specimen of the xi cent. appears in stone over the church gate at Neissen in Saxony. It became a prevailing characteristic of the late Renaissance works, and in the reign of Henry II of France. The "Grolier scroll" in book-binding is also a fine example. Some of the ornamentation shown in the works of the Elizabethan and Jacobean school has the same term applied to it.

STRASSBURG (Anc. Argentoratum, to about vi cent.; Fr. Strasbourg; It. Strasburgo). A strongly fortified town belonging to Germany until 30 Sept. 1681 when it was taken by France, and became the capital of the department of Bas Rhin; since the peace of Frankfurt 10 May 1871 it is the capital of Alsace and German Lorraine. It is situated on the narrow river Ill, over which are some forty-seven small bridges, and near the river Rhine, which at Kehl is crossed by a bridge of boats, and also by the great railway bridge, 1859-60; *Die Eisenbahnbauten bei Kehl*, 80 pl., fol., Carls., 1860. **BUILDER** *Journal*, 1861, xix, 461; *BUILDING NEWS Journal*, 1859, v, 808; vi, 449; *CIVIL ENGINEER, ETC., Journal*, 1866, xxix, 355-6; *ALLGEMEINE BAUZEITUNG*, 1861, pl. 415-6. *NOUVELLES ANNALES DE LA CONSTRUCTION*, 1862, viii, pl. 33-6. The seven old gates are removed and new ones opened; the old pentagonal citadel 1682-4 was knocked to pieces in 1870. In 1768 a plan by J. F. Blondel was approved for improving the town; it comprised the large *place d'armes* and various new buildings. In Dec. 1871 the town was to be reconstructed on new lines. The monument to genl. Desaix is an obelisk on a pedestal. The statue of Lézy Marnésia, prefect (1810-4), by Grass, 1857. Monument to Gutenberg, 24 June 1840, is by David of Angers, the pedestal by A. F. R. Leclère; *DALY, Revue Générale*, 1840, i, p. 251, and 2 last pl.; *GOURLIER, etc., Choix d'Edifices*, fol., Paris, 1837-44, iii, 320. Bronze statue of Kleber 1840 by Grass; *idem*, p. 759.

It is the see of a bishop. The cathedral, dedicated to the Virgin Mary, has been considered one of the noblest Gothic churches in Europe. The choir *cir.* 800 with Romanesque crypt of S. Sepulchre; 1177-9, niches and transepts; the choir has no ailes, is 67 ft. wide and lower than the nave. The transepts end of xiii cent. are square, each with a round pillar in the centre, and a large circular window. The nave dating in early part of xiii cent., was nearly finished by meister Wehelin, and completed 1275 or 77 perhaps by Erwin von Steinbach, who restored and heightened the body of the church after the fire of 1298; some rebuilding from 1311-7 by Burcard Kettener, and one west tower; nave continued by J. Erlin (died 1343); 1347 east tower, gallery and vaulting of choir, completed 1366 by Erard Maler (died 1400). The edifice was repaired 1455-60, and vaulting renewed 1459-69 by J. Dotzinger, which, thrown down 1542 was rebuilt 1547 by D. Speckle or Specklin. Steinbach 1277-91-1318 added the west façade, leaving unfinished part of the second story; it comprises a highly enriched triple portal, and above it a window 42 or 48 ft. diam.; it was completed 1318-39 to the platform between the towers by his son Hans; (the third story is an addition making a height of 230 ft.). In 1339 the spiral angle staircases of open work, etc., were commenced by H. Hiltz or Hultz sen., and the platform finished 1365; continued by Heckeler, and others, as 1400-20 by U. von Heinz or Ensinger of Ulm; Johann and Wenzel did the octagonal story and turrets; a low story and spire were added 1421-39 by H. Hiltz jun.; its terminal with other parts injured by lightning, was 1744 restored by J. M. Erlacher: (also 1833 and 1843, as stated s. v. **LIGHTNING CONDUCTOR**). Most of the 18 original drawings on parchment preserved in the Frauenhaus relate to this façade and tower; as described in *BUILDER Journal*, 1846, iv, 483. This tower is said to be 465 ft. high (500 or 525 ft. or 474 ft. Engl.), it was formerly considered the loftiest in the world, but that of S. Nicholas at Hamburg is stated to be 472 ft. The dimensions of the edifice are variously given; the church as 324, 357, 355 Engl. ft. long; the nave only as 132 ft.; 72 ft. and 79 ft. high. Transepts 150 ft. and 98 ft. high. *FERGUSSON, History*, 1867, i, says nave 250 ft. long, central aisle 55 ft. wide between centre of piers; side ailes 33 ft. wide; vault 101 ft. high; tower 468 ft. high. The proportions of plan are noticed in *GWILT, Enceye*, edits. 1867 and 1876, p. 969; and of the plan and façade in *ALLGEMEINE BAUZEITUNG*, 1845, pl. 651.

In the south portal (Romanesque), the ornamental work is ascribed to Steinbach's daughter Sabina; a statue of her by Grass was set up 1842 (*DALY, Revue Gén.*, iii, 236); this portal is given in *GAILLIABAUD, Monumens*, 1850, ii. The organ, 1493, etc., *idem*, iii. New doors were added 1878; *ACADEMY Journal*, xiv, 99. The stained glass, xiv and xv cents., is sombre; it was under repair, etc., 1854. The *font (taufstein)* 1453 is by J. Dotzinger. The stone pulpit very richly carved 1485-6 by Hans Meyger or Hammer; its canopy was replaced 1617 by C. Cullen and his son. 1489 arched record chamber near the chapel of S. Catherine, by H. Hammerer; 1494-1505 the former Lorenz kapelle on the north side by J. de Landsbut; 1515 chapel of S. Martin rebuilt, now the chapel of S. Lorenz; 1539-47 J. Spiegel, architect to the town, succeeded by M. de Zeitz; 1542 chapel of S. Catherine, built 1331, was revaulted; 1563 M. Schan, at work; 1622-43 J. Heckeler directed works. The structure was much injured during the Revolution; 235 statues taken down of which only 65 were preserved. It was in good repair and interior cleaned in 1857; south-east tower restored 1860. All traces of the siege of 1870 have been repaired. The towers over the cross and apse completed 1879. The *frauenhaus* or maison de Notre Dame 1581 has a good winding staircase.

SCHAD, *Beschr. des Munster*, 8vo., 1617. *Description de la Cath.*, 4to., Strasb., 1737. SCHWEIGHÄUSER, *Descr. nouv. de Cath. et de sa fameuse Tour*, 12mo., 3rd edit., 1770; 1780. BOEHM, *Descr. de la Cath.*, 8vo., 1770. GRANDIDIER, *Cath. de Strasb.*,

8vo., 1782, p. 31; 37-9; 40-50. GRANDIDIER, *Essais historiques*, 8vo., 1782. LA BORDE, *Monumens de France*, fol., Paris, 1816. WETTE, *Mém. sur le Munster*, 1820, in ZSCHOKKE, *Erhellerungen*, 1822, ii, 141. CHAPUY ET JOLIMENT, *Vues pittoresques Cathédrale*, 4to., 1827. SCHREIBER, *Das Münster*, 11 pl., 8vo. and fol., 1828-9, is said to give the names of the architects from J. von Landshut to the XVIII cent. FRIEDERICH, et SANDMANN, *Détails de Cathédral*, fol., 1839. RAMÉE, *Moyen Age Monumentale*, fol., 1840-4, pl. 31, 188, 28, 305, pulpit 322, organ 209, font 238. RAMÉE, *Manuel de Hist. de l'Arch.*, 8vo., 1843, ii, 354-9. LE ROY DE SAINTE CROIX, *Monog. de la Cath.*, 4to., Str., 1881. A. VON BAIER, *Strasbourg Cath.*, etc., fol., Frieb., 18... BUILDER *Journal*, 1857, xv, 241, by J. A. PICTON; 1860, xviii, 200; xxi, 681 with mason's marks. *Goethe on the Cathedral*, transl. in CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 315. View of north side of the nave, and interior arcades, in SHAW, *Architectural Sketches*, fol., 1858, pl. 36-7. HOLLAR, *The Cath.*, on two sheets, with a lesser view 1645.

Among the other fifteen or more churches are; S. Stephen, the oldest; S. Martin also ancient; Le Temple neuf (French protestant), dating 1254, originally the church of the Dominicans; being quite destroyed in 1870 it was rebuilt 1873 by..... SCHNEEGANS, *Ancienne école de Temple neuf*, 8vo., 1856. S. Thomas, now Lutheran, is ascribed to Erwin von Steinbach 1270 or 1273-90; nave and aisles rebuilt 1313-90; SCHNEEGANS, *Eglise de S. Thomas*, 8vo., Stras., 1842, p. 52-6, names 1311 Bruard Kellener and six other architects ending 1540 with Jerome Bertschin. The Synagogue 1834 is handsome. The cemetery near the Butcher's gate is like père la Chaise of Paris.

The préfecture *cir.* 1768, now the residence of the governor of Alsace, is by J. F. Blondel. Old hôtel de ville, now hôtel de commerce, 1585 by Dan. Specklin, in GOURLIER and others, *Choix d'édifices*, fol., 1837-44, iii, pl. 320. Palais du roi formerly the bishop's palace, *cir.* 1708 or 1731-41 by R. de Cotte, now the university buildings (founded 1621, 1803 French academy, reopened 1872), new buildings 1878-84; new library for 500,000 volumes. Palais de justice. Public library, and also the picture gallery in Kleberplatz were gutted. The mint; custom house; public granary; corn exchange or *mehlhalle*, 1827, by Billot or Villot, ALLGEMEINE BAUZEITUNG, 1837, pl. 148; theatre 1768 by J. F. Blondel with Ionic colonnade; rebuilt 1805-21; restored 1873; three hospitals; a noble arsenal and vast barracks 1768 for cavalry and infantry, by J. F. Blondel; the S. Nicolas barracks 1784; railway station, burnt 1870; abbatoir, see *Detached Essay*, p. 6; are among the other noteworthy edifices. Many chimney tops are given in DALY, *Revue Gén.*, 1858, xvi, pl. 26. 1. 14. 15. 28. 50. 96.

SCHADEUS, *Summ. Argent. templum*, 4to., 1617; 1750. DE TARADE, *Plans, etc., of S. Peter's at Rome, parallel with Stras. Cath.*, fol. (1649). *La Véritable Description*, fol., Stras., 1700. WEIS, *Représentation des fêtes pour la convalescence du roi Louis XV*, fol. (1750?). GRAFFENAUER, *Topog. phys., etc., de Strasb.*, and plan, 8vo., 1816. HORMANN, *Notices sur la ville de S.*, 8vo., 1817-9. List of books at end of Supp. to AUFSCHLAGER, *Alsace*, 1826, ii, 361. CHAPUY, *France Mont.*, fol., 1827, pl. 93. PROUT, *Fac-similes of Sketches*, etc., fol. (1837), 2 plates. SCHMID, *Notice sur la ville*, 8vo., 1842. PITOU, *Stras. illust.*, 80 pl., 4to., 1855. BAEDER, *The Rhine from Rotterdam, etc.*, 9th edit., 8vo., Leip., 1884. ILLUSTRATED LONDON NEWS, *Fêtes*, 1852, xxi, 73: *War*, 1870, lvi.

For the lodge of masons, see DOTZINGER; STEINBACH; FREEMASON; BUILDER *Journal*, 1863, xxi, 681. GOULD, *History of Freemasonry*, 4to., 1882, i, 107-77, giving the *steinmetzen* of Germany. FREEMASON'S MAGAZINE for 1862, p. 283. MARK, MASTER OF THE WORKS.

STRASSOV (IVAN), probably Stasov and Starov.

STRATONICEIA. Represented by Eskihissar, in Asiatic Turkey. The theatre 390 ft. ext. diam. and 120 ft. int. diam., is given in SOCIETY OF DILETTANTI, *Ionian Antiq.*, fol., London, ii, pl. 36. The seats were entire about 1820, and the fragments of

the scene lie piled one above the other, and to appearance freshly destroyed. A long inscription relating to provisions was found 1709 and copied; *Hart. MS.*, 7509; LEAKE, *Asia Minor*, 8vo., London, 1824, p. 229, 328. CHOISEUL GOUFFIER, *Voy. Pitt.*, fol., 1782-1809, pl. 78-82. 25. 78.

STRATTON (THOMAS), 1461 clerk of the works and surveyor to king Edward IV, with fees, wages, etc., *Rolls of Parliament*, v, 473a; and in more detail in p. 350a, *temp.* 1464.

STRAUNGE (JOHN) 1413-8, clericum operationum to king Henry V at Shene and the tower of London. DEVONS, *Issues*, 4to., 1837, p. 357. He had cloth for a gown; British museum, *Addit. MS.* 17,721; RYMER, *Foedera*, in Syl., etc., xvii, 4600-1, No. 90, 93, 180, 211. Perhaps the *Addit. MS.* 4596, fol. 101, *temp.* 1400 may also refer to him.

STRAW. The dried stems of wheat. Straw, REED and RUSH were formerly used for strewing the floors of halls and rooms. 22 Henry VIII, a MS. states that "the proper officers are, between six and seven o'clock every morning, to make the fire in, and straw his highness' privy chamber"; *ARCHÆOLOGIA*, 1786, iii, 155. No. 36 trusses of wheat straw is a load; they weigh about 1,296 lb. Also used for THATCHING the roofs of houses, sheds, rustic buildings, and cottages. Straw is said, s. v. Lightning conductor, to be a valuable conductor of electricity. A "straw yard" of a farm is given in ILLUSTRATED LONDON NEWS, 1846, viii, 73.

STRAW BARN. The size depends upon the maximum number of acres sown, and also the yield of wheat per acre. On the wolds, a good crop of wheat is two loads per acre or 750 cubic ft.; Barley three loads or 1,125 ft. per acre. Mr. Leigh of Luton Hoo has designed the largest barn in England; it holds the produce of upwards of 1,000 acres, no stack being made on the farm. The soil, weather, and crops are so variable and produce such different results, that the size of a barn cannot be reduced to any fixed law; in one year the straw may be a third less but not so the corn: reaped or mown makes a difference. BARN.

STRAWBERRY; *Fragaria*. This plant has been used in decoration for its form of leaf and colour of the berry, as in paperhanging, carved work, etc. COLLING, *Gothic Ornaments*, and similar publications. 14.

STRAW COLOUR. In oil paint, a mixture of white, yellow ochre, and orange chrome. "Straw yellow" is made by light yellow mixed with a little grey, of which pyrite, a variety of the topaz may represent it.

STREET. "A street is a broad and maine way for horsemen and footmen to passe, and where great store of passengers walk and traveyle to and froe, especially in a citie or town"; a lane is less; and an alley hath a stop; NORDEN, *Speculum*, 1723. Under the provisions of the Metropolis Management amendment act 1862, sec. 98, 99, and 112 includes a "mews"; and the Metropolis Management and Building acts amendment act, 1882, secs. 7 and 8, the duty of regulating the width of roads, streets, and passages, devolves upon the Board. A width of 40 ft. is required for streets intended for carriage traffic, and 20 ft. for foot traffic. The Amendment act of 1878 forbids the erection of any building, without the written consent of the Board, in such a position that its external wall or forecourt boundary shall be within 20 ft. of the centre of a carriageway or 10 ft. of the centre of a footway. FITZ ELWYNE'S *Assize of Buildings*, 1 Richard 1st, 1189; in RILEY, *Liber Albus*, 4to., London, 1861. H. LAW, and D. K. CLARK, *Construction of Roads and Streets*, 12mo., 1877; 2nd edit., 12mo., 18... BOULNOIS, *Municipal and Sanitary Engineering*, 8vo., 1885. BUILDER *Journal*, 1863, xxi, 626. GRADIENT; and BUILDER *Journal*, xvii, 214; and 1863, xxi, 818.

"The French law at present in force is the Imperial decree of 27th July 1859, which is to this effect: the height of the façades of houses abutting on the public streets in the city of Paris is determined by the legal width of such streets. This height, measured from the foot-pavement at the foot of the

façade, and in all cases at the centre of such façade, including entablatures, attics, and all constructions in the same plane as the face of the wall, shall not exceed—

	mètres. feet.	mètres. feet.
For streets under 7.80 = 25.58 in width	11.70 = 38.37	
For streets above 7.80 = 25.58 and up to 9.75 = 31.98 in width	14.60 = 47.88	
For streets above 9.75 = 31.98	17.55 = 57.56	

In streets or boulevards 20 mètres (65.6 ft.) or upwards in width, the height of buildings may be carried up to 20 mètres (65.6 ft.) on condition that including the entresol there are not more than five square storeys above the ground floor"; CATES, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Proceedings*, 1880-1, p. 189. *Manuel des Lois du Batiments*, Table general, v, 1495, *Rues*; and iv, 636 and 941.

A long article on streets in Italy is given *s. v.* "Strada" in MORONI, *Diz.*, 8vo., Venice, 1854, vol. 70, p. 112. The Roman-Greek streets at Demetrias, in Thessaly, founded about B.C. 290, had "the space between one street and the next parallel to it, little more than 15 ft." After the time of the architect Hippodamus, B.C. 440, the Greeks even began to lay out ordinary streets at right angles, and the Peiræus was rebuilt in this way, as is New York. ROAD. VIA. 23.

STREET (GEORGE EDMUND); 1871, R.A.; F.S.A.; P.R.I.B.A. Born 20 June 1824, at Woodford, Essex; became 1841 a pupil of O. Carter of Winchester, and April 1844 of sir G. G. Scott; began 1848 to practise at Wantage; 1852 at Oxford having been nominated diocesan architect; and 1856 in London; he was also architect to the dioceses of York, Ripon, and Winchester. The following are comprised amongst his noted works; (* are restorations). *The South transept of York cathedral; *Carlisle; Kildare; S. Canice at Kilkenny; *church of S. Peter Mancroft at Norwich; at Clun, Welshpool, and *Hythe; the nave of Bristol cathedral; *Christchurch cathedral, at Dublin. S. James the less, Westminster; All Saints, Boyu hill, at Maidenhead, with its almshouses; All Saints, Clifton, of great span; S. Mary Magdalene, Paddington; S. Philip and S. James, Oxford; S. John's, Torquay; at Bournemouth; Kingstone, Dorset; several in the eastern riding of Yorkshire for sir Tatton Sykes; S. Saviour at Eastbourne; S. Margaret's, Liverpool; S. John the divine, Kennington; the garrison chapel at Portsmouth; the chapel at Dunecht, Aberdeenshire; and S. Mary at Holmbury; also at Genoa, Lausanne, Vevay, and Mürren; the Memorial church at Constantinople; the American churches at Rome and Paris; the English church at Rome; and the recasting of the interior of the Guards' chapel in Birdcage walk (Romanesque). The theological college at Cuddesdon; S. Margaret's convent, East Grinstead; Gothic house in Cadogan square; Dunecht house, Aberdeenshire (Romanesque) for lord Crawford; and his own residence at Holmbury, near Dorking, Surrey.

In 1868 he received the appointment as architect to the Courts of Justice, having taken part in the competition of 1867; he also competed 1856 for Lille cathedral; 1860 for the Foreign and India offices; 1867 national gallery; and 1872 Edinburgh cathedral. Besides numerous contributions to Journals, especially the *ECCELSIOLOGIST Journal*, and Papers read at meetings of Societies, including the Royal Institute of British Architects, *Churches of Le Puy en Velay*, 1861; *S. Michael Penkevel, Cornwall*, 1862; *English Woodwork in XIII and XIV Cent.*, 1865; *Differences of Style in Old Buildings*, 1869; and *The President's Address*, Nov. 1881: are, *Brick and Marble Architecture in Italy*, 8vo., 1855; 2nd edit., 1874; *Gothic Architecture in Spain*, 8vo., 1865; 1869; *Remarks, etc., on the Scheme for the Completion of S. Paul's Cath.*, 8vo., 1871; *Lectures at the Royal Academy*, in *BUILDER Journal*. "In design he began with the more rigidly orthodox English; returned from Italy with the features of Italian Gothic; but returned to the purity and elasticity of the Edwardian style." He was one of the most indefatigable workers known in the profession. A

portrait appeared in *BUILDER Journal*, 1869, xxvii, 706; a statue 1884 by Armistead in the Law Courts; and a bust by the same sculptor presented 1886 to the Royal Inst. of British Architects. His son Arthur Edmund Street, M.A., has succeeded him; amongst his many pupils were the late Fred. Deshon; W. Wood Bethell; Wm. Wilson; W. H. Romaine Walker; Herbert Goodall; A. M. Calderon; and V. C. Scholefield. Amongst his assistants were Norman Shaw, R.A.; Philip Webb; J. D. Sedding; T. E. Collett; Wm. Morris; late James Bell; H. G. W. Drinkwater of Oxford; T. J. B. Holland; Wm. Rushworth; G. D. Oliver of Carlisle; E. F. C. Clarke; J. Neale, F.S.A.; F. G. Knight; F. Darling of Canada; J. Moncrieff; — Dodgshun; — Unsworth; A. W. Tanner; W. Millard; C. H. Löhr; P. Currey; R. C. Page; S. Vacher; E. E. Deane of Boston, U.S.A.; F. Hemings; L. Stokes; and F. Miller. He died 18 December 1881, and was buried in Westminster abbey. HOPE, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1883-4, p. 199-203. *BUILDER Journal*, 1881, xli, 777 referring to illustrations therein; 784 with list of works; 831. *Street's English Cathedral Work*, in *ARCHITECT Journal*, 7 Jan. 1882. BARNETT, *The Work of the late G. E. S.*, 1882.

STRENGNÄS. A town situated in the province of Södermanland, on the south side of the lake Mälär, in Sweden. It is the see of a bishop. The cathedral dedicated to, is a large and handsome structure with a crypt, consecrated 1291 and burnt, rebuilt and damaged by other fires 1551, 1630, and 1723. It is 262 ft. long, and mostly of brick. A full account is given in *ECCELSIOLOGIST Journal*, 1847, vii, 99, 191. An old gymnasium, with a library, etc., bishop's palace and consistory. The cathedral library, founded in xv cent., museum of Scandinavian antiquities, etc., formed during the thirty years' war was burnt Jan. 1865. 14. 28. 50. 96.

STRENGTH. That property of bodies by which they resist breakage or fracture. "The strength of a wall depends rather upon its stability, than upon the greater or less hardness of the materials"; and "Strength sufficient (for the immediate purpose) is not strong enough, therefore it is better to have too much solidity than too little"; DONALDSON, *Maxims, etc.*, 8vo., 1847, p. 44. The principal points in commencing a composition, are convenience, strength, and beauty. Strength is acquired by just construction, and the fewer materials by which it is obtained, consistent with economy, the better; ELMES, *Dict.*, *s. v.* Architect.

STRENGTH OF MATERIALS. This term is applied to the resistance which all materials used for building purposes offer to any strains to which they may be subjected. The strength of any material is usually measured by the force that will break it or otherwise render it useless for its purpose as part of a structure, and this force is called its *absolute* or *ultimate* strength. The STRAINS to which building materials are generally subjected are either *tensile*, *compressive*, or *transverse*; the last is, however, a combination of the first and second. *Tensile* strain is usually applied in the direction of the length of a body, and tends to pull asunder the fibres or particles of the body, or to overcome the cohesion of the particles of which it is composed; and as the resistance is proportional to the number of such fibres or particles, it will vary as the area of the transverse section taken at right angles to the direction of the force, where the body is homogeneous or of equal strength throughout. When a tensile strain is applied to a prismatic body in the direction of its length, the body will be gradually drawn out or lengthened, the extension increasing with the force applied. If the body returns exactly to its original length after the force is removed, it is said to be *perfectly elastic*; but if there is a *permanent set* in the body the elasticity is *imperfect* and the body has been injured by the action of the force. All building materials possess a certain amount of elasticity, and it is usual in practice to consider that as long as the extension increases in the same ratio as the tensile force the elasticity

remains unimpaired. The resistance to tensile strain is usually measured by a quantity called the *modulus of elasticity*, which is found by experiment and tabulated for all kinds of materials. If the original length of a prism of one square inch section is called L , and l represents the extension produced by a force p , then l is to L as p to the constant E , which is called the *modulus of elasticity*, and is that force which would stretch the prism to twice its original length, supposing such a thing to be possible without injuring its elasticity.

Compressive strain is that which tends to crush the particles of a body; and either to break it to pieces or so to alter its shape as to render it useless for the purpose to which it is applied. A prismatic body under compression becomes shortened when the force is applied in the direction of its length, and as long as this shortening is proportional to the force applied the *elasticity* of the body remains unimpaired for practical purposes, and when the force is removed it will return (very nearly) to its original length. In short prisms, whose length does not exceed six times the diameter, the resistance to compression varies as the area of the cross section in homogeneous bodies, but as the length is increased in proportion to the diameter a tendency to flexure is produced, and in pillars from 6 to 25 diameters long, rupture will be produced partly by crushing and partly by bending. When the length exceeds 25 diameters the rupture takes place entirely by bending, so that the resistance to crushing hardly comes into play. In pillars of 30 diameters long the resistance varies as the fourth power of the diameter and inversely as the square of the length in timber and steel; but in cast iron it is as the 3.5 power of the diameter and inversely as the 1.63 power of the length.

In fibrous materials—as timber, wrought-iron and steel—the resistances to compression and extension are nearly equal, as long as the elasticity remains uninjured; but in crystalline and non-fibrous substances—as cast-iron, stone, and brick—the resistance to compression greatly exceeds that to extension, the *ultimate* resistance being in cast-iron as 6 to 1, and in some kinds of building stone as 12 to 1. It is therefore essential to avoid using these latter materials for any parts of a structure which are liable to tensile strains.

Transverse strain is usually produced in beams which are supported at their two ends and loaded at some intermediate point or points. A beam subjected to such a load assumes a slightly curved form, and is deflected from the horizontal, such *deflection* increasing with the increase of load. In this case the fibres or particles in the upper part of the beam are compressed and those in the lower part extended, so that the beam is subjected to both a tensile and compressive force at the same moment. The fibres near the top and bottom edges will be more strained than those near the middle, the strain being zero at the centre of the beam; the horizontal section taken through the middle of the beam is called the *neutral surface*, as in it the fibres are neither compressed nor extended. If a transverse section is made, the intersection of the *neutral surface* with that section is called the *neutral axis*, and this has been shown both by theory and experiment to pass through the centre of gravity of the section, as long as the resistances to extension and compression are proportional to the tensile and compressive forces respectively, or these forces do not exceed the *limit of safety*. When a beam is strained in this manner, there are two kinds of resistances called into action, *resistance to rupture* and *resistance to flexure*, which follow totally different laws; the former being proportional to the breadth and square of the depth and inversely as the length of the beam; while the latter varies as the breadth and cube of the depth, and inversely as the cube of the length. It is of far greater importance in securing the stability of a structure to ascertain the *resistance to flexure* in beams than the *resistance to rupture*. The resistance to flexure is inversely as the deflection caused by the load on the centre of a beam, which can be calculated for any given load when the *modulus of elasticity* of the material

ARCH. PUB. SOC.

is known, the *resistance* being proportional to the *modulus*. The rules for finding the strength of beams are given s.v. GIRDER. Taking the *resistance* to rupture by *transverse strain* as 1 in Mansfield red sandstone, that of Yorkshire stone is about 2; of Caithness stone 5; of Welsh slate 11; of Fir from 4 to 8; and of Wrought Iron 44.

The mechanical effect of a load on a horizontal beam depends very much upon the manner in which that load is placed upon it. In a beam supported at each end, A and B , and loaded at any intermediate point C , the strain varies as the product of the lengths AC and BC divided by AB , and is greatest when AC equals BC , or the load is all at the middle of the beam. If the load is uniformly distributed over the whole length of the beam, the deflexion produced at the centre is five-eighths of that produced by the same load concentrated at the centre; so that the *resistance to bending* in the two modes of loading is as 8 to 5; the *resistance to rupture* under the same circumstances is as 10 to 5. When a beam is placed in a *slanting* position, as the rafter of a roof, the load produces a strain partly transverse and partly compressive, the latter acting down the axis of the beam. The relation of these strains depends on the *angle of pitch* of the rafter, the weight multiplied by the *cosine* of that angle representing the transverse strain, and the weight multiplied by the *sine* representing the compressive strain.

The rules given for strength of materials usually indicate the load that will produce rupture, or the *ultimate strength* of the body; but for practical purposes the load that may be *safely* and *permanently* laid upon it is required to be known. The ratio which the *safe load* bears to the *ultimate strength* is called the *coefficient of safety*, and is an arbitrary quantity determined by experience for different kinds of material. For steel and wrought-iron this *coefficient* is one-third; for cast-iron, one-fourth to one-sixth; for timber, stone, or brick, it is one-eighth to one-tenth. A more scientific method of arriving at the *safe load*, is to calculate directly the load that will produce a given strain per square inch on the material; thus, in oak or fir the *safe tensile strain* is from one-half to three-quarters of a ton per square inch of section; in cast-iron the *safe strain* is from 2 to 3 tons for tensile strain, and from 8 to 10 tons for compressive strain per square inch; in wrought-iron the *safe tensile strain* is 5 tons, and in steel about 10 tons. In stone the resistance to extension is not taken into account, but only that to compression, the *safe load* varying from 150 lbs. per square inch in Bath stone to 800 in Aberdeen granite.

E. W. T.

BEAM. COHESION. CRUSHING WEIGHT. DYNAMICS. GIRDER. JOIST. METAL. PERMANENT SET. RESISTANCE. RUPTURE. SAFE LOAD. SET. STATICS. STRAIN. STRESS. THRUST. 1. 14.

Besides the publications named in the above Articles; see RONDELET, *L'art de bâtir*, fol., 1852; Supp. by BLOUET, 1852. NAVIER, *Résumé des leçons, etc., sur l'application de la Mécanique*, 1836. *Annales des Ponts et Chaussées*, viii, 1833. HODGKINSON, *Experimental researches on strength of pillars*, in PHIL. TRANS., 1840 and 1857. HODGKINSON, *Researches on Cast Iron*, 1846. *Report of Commission on application of Iron to railway structures*, 1849. BARLOW, *Strength of Materials*, 1837; 1851 and 1867. BOX, *Strength of Mats*, New York, 1883. BAKER, *Strength of Beams, etc.*, 1870. FENWICK, *Mechanics of Construction*, 1861. DE VOLSON WOOD, *Resistance of Materials*, New York, 1871. TATE, *Strength of Materials*, 1859. TARN, *Science of Building*, 2nd edit., 1882. TREDGOLD, *Carpentry*, 7th edit. by E. W. TARN, 1886. SPON, *Dictionary of Engineering*, 1869 to 1881. FAIRBAIRN, *Application of Iron to building purposes*, 3rd edit., 1864. LEA, *Tables of strength and deflection of Timber*, 1861. LASLETT, *Timber and Timber trees*, 1875. RANKINE, *Applied Mechanics*, 1868, p. 631. MORIN, *Leçons de Mécanique pratique*, 1853.

STRESS; see STRAIN.

STRETCHER (Gr. *diatonos*; Fr. *carreaut*). A brick or stone so placed in a wall that its longest side shall be parallel to the face of the wall; the brick or stone placed in reverse way is called a header, or through brick or stone. 1. 4. 25.

R R

STRETCHING and TEARING; see STRENGTH OF MATERIALS.

STRETCHING COURSE. A row, or course, in which the bricks or stones are placed with their longest faces exposed to view. STRETCHER. It is the reverse of a "heading course". ENGLISH BOND. FLEMISH BOND.

STRETCHING PIECE; see STRUT.

STRIA. A facet or fillet; "1736, the fillet or ray separating the striges or flutings of a column." A flat surface, or plane, in lieu of fluting to the shaft of a column. As at Tegea; the small Doric columns within the Parthenon at Athens; the lower portion, nearly 7 ft. high of the columns to the portico at Delos; at Pompeii, in the triangular room and bath in a villa, where there are 12 or 16 planes for their whole height; in the portico behind the great theatre to nearly half their height; and in the colonnade round the agora to about one-third their height; INWOOD, *Erechtheion*, fol., London, 1827, p. 70. POLENUS, in VITRUVIUS, 1825-30, iii, 3; iv, 3; iv, 4. FLUTE. STRIX. PLANE of a column. 4.

STRIATED. Chamfered or channelled, as scollops and other shell fish, as explained 1736. 4.

STRIGA; see STRIX.

STRIKE. An instrument used by plumbers in casting sheet lead, with which they draw off the surplus lead into the cavities prepared for it. PIG; Sow. An old word for an iron spear, or stanchel, in a gate or palisade; PUGIN, *Specimens*, in *Glossary* by WILLSON. 4. 19.

STRIKER. A piece of lath about ten inches long with which the workman strikes, or cuts, off the mortar at the britches of the tiles; a broom is then used to sweep the tiling after it is struck. 4.

STRIKING. The drawing of lines by the square, on the face of a piece of stuff, for a mortise; for cutting the shoulders of a tenon, etc. Drawing the lines on the surface of a body.

STRIKING. The act of removing a centre after the completion of an arch, which it had supported during the construction, and during the time the mortar consolidated.

STRIKING, sticking, or running. In joinery, is the shaving away the superfluous part of the wood, till the section be of the required figure, as for a moulding, etc. NICHOLSON, *Arch. Dict.*

STRING. A fine string is used to take the girth of mouldings, etc.; see STRING MEASURE. A term sometimes applied to a circular belt; see RING. 1. 14.

STRING BOARD (Fr. *coquille*, *limon*), also NOTCH BOARD, BRIDGE BOARD. "Wall string" in Lancashire. In wooden stairs, the board next the wellhole which receives the ends of the steps; its face follows the direction of the wellhole, straight or curving. When curved it is frequently formed in thicknesses glued together, though sometimes it is got out of the solid. This may be either "close", or continuous, or "cut" to treads and risers, and also molded. The piece next the wall is continuous and is grooved to receive the tread and riser and is called the "wall string". BRACKET. J. B. Franque of France, who died 1758, is specially praised by his biographer as being the first to make large hanging staircases which have steps carrying strings that are not more than $8\frac{1}{2}$ or $9\frac{1}{2}$ ins. wide, and that are flush (*à la règle*) on the underside. Strings glued up on cylinders are explained in joiners' text-books. 1. 14.

STRING COURSE (Fr. *cordon* and *bandeau*, in VIOLETT LE DUC, *Dict. Rais.*). A narrow continuous horizontal band or moulding, projecting slightly from the face of the wall. "Strings contrast the vertical lines of Gothic architecture with subordinate horizontal lines; a string under the cill is a great ornament, and gives an appearance of finish which is by no means to be neglected. Moreover the light is more strikingly thrown and more clearly defined by a dark line running immediately below it"; ECCLESIOLOGIST *Journal*, 1842, ii, 171. "At an abbey tower in the county of Mayo, are two string courses or water tables, peculiar to the Irish buildings in the western counties; it was used as a substitute for the lead, which is

now usually employed for such purposes; those illustrated have a peculiarity in the weathered joints of the stone, in the protection of those joints, and in the sectional outline, showing great ingenuity and design". WILKINSON, *Geology, etc., of Ireland*, 8vo., London, 1845, p. 136. A string course termination, from Wells cathedral, north porch, is given in COLLING, *Gothic Ornaments*, 4to., London, 1850, ii, pl. 97. KITTOE, *Illustrations, etc.*, fol., Calc., 1838, pl. 3 and 17. BELT. BAND. KING-TABLE, temp. Edward III. GOLA. LABEL. IMPOST.

STRING MEASURE. It consists in girthing the log of timber in the centre by a string, and multiplying a fourth of this dimension by the length, which gives the cubical contents, not always correct with unequal sided logs. Timber importers and the Government measure with the calliper or compasses, as it would be difficult to use the string in water. The subject is discussed in DUBLIN *Builder Journal*, 1859, i, 161; and ii, 1860, p. 202. Yellow pine (S. John's) string measure is stated to be from 11 to $14\frac{1}{2}$ per cent. less than calliper measure; birch (S. John's) averages 20 per cent. less; Quebec yellow pine $9\frac{1}{2}$; red pine, from 8 to $14\frac{1}{2}$; Quebec birch averages 10; Quebec oak $8\frac{1}{2}$; Dantzic and Memel fir from $7\frac{1}{4}$ to $8\frac{1}{2}$; Riga fir averages 12, and pitch pine 8, all less. Another writer states that he has found a difference in favour of the string of from 5 to 25 per cent. according as the timber was squared or wany. Timber is sold (1860) by calliper in all the Irish markets, and in the English ports except Liverpool. *Builder Journal*, 1860, xviii, 31; 46. GRANDY, *Timber Importer's, etc., Guide*, 8vo., London, 1865, p. 25-6.

STRING PIECE. An obsolete term for that part of a flight of stairs which forms its ceiling or soffit. The covering of the piece or pieces of timber (carriages and bracketing) put under the flying steps of a wooden stair for their support, whether matchboards, or lath and plaster, as a ceiling. PLANCEER. 1.

STRINGY. Deals that warp and twist like whalebone are termed by carpenters "strong". Such deals have likewise the bad property of rending themselves to pieces as they dry, and become "shaky". Deals that when acted upon by the saw, do not form sawdust but are torn into long strings or fibres, and are termed "stringy", are in general of this *strong* character.

STRIP. In repapering a room, the old paper should always be washed off and the plastering prepared for the new paper, or for lining paper first as in best work. This should always be done in regard to health, especially in humble dwellings; if the plastering be well done so as to allow of it. In re-covering a roof with slates, tiles, lead, or thatch, it is usual to first strip it in such a careful manner that the sound materials may be re-used.

STRIPED PILASTER; see RUSTIC.

STRIPED WORK. The face of good masonry in Scotland is "droved, broached, and then striped or chiselled, and may then be 'rubbed' or polished." Some faces of stones are "dragged". STROKED WORK. 1.

STRIX, and STRIGA. A flute of a column. VITRUVIUS, iv, 4, has striges, striges, or flutes; "striga" meaning the length of a furrow as "scammes" is the width of it; HYGINUS, in *Gromat.* STRIA. FLUTE. 4.

STROELIN (RUDOLPH), about 1650 built the church of the Holy Ghost, at Regensburg. 68.

STROKED WORK. Stroking is done by a mason to the surface of a stone to clean off the marks of the "boaster" or boasting chisel before rubbing. It is done by a "broad chisel" $3\frac{1}{2}$ ins. wide. The "strokes" are carried in one line of chisel down the face; tooling is in several rows of lines. STRIPED WORK. BROAD AXE.

STRONG (TIMOTHY), mason, born in Wiltshire, settled at Little Barrington, Gloucestershire, where he was quarry owner. He died 1635 or 36, leaving a son VALENTINE (freemason), who worked with his father, and also at Taynton, Oxfordshire; about 1630 he built the south front of Cornbury, Oxfordshire, with cellars, great hall, and rooms adjoining (N. STONE); 1640

built a house for W. Whitmore, esq., at Slaughter, near Stow on the Wold, Gloucestershire; 1651-3 one for J. Dutton, esq., at Sherborne; and 1661 one for A. Barker, esq., at Fairford, where he died 26 Dec. 1662 (BIGLAND, *Fairford*, 1791, p. 31). Nov. is stated in GOULD, *Freemasonry*, 4to., 1884, iii, 40, who gives the epitaph. He had six sons, THOMAS, William, EDWARD, Valentine living in 1716; Timothy and John.

THOMAS was engaged at Longleat by sir John Thynne, and finished the house at Fairford. About 1663 he built the large stables at Cornbury fronting Charlbury, for the earl of Clarendon, by direction of Hugh May; 1665 built the lodgings for scholars at Trinity college, Oxford, under sir C. Wren; and that part of Cornbury fronting Oxford, with the terraces, under H. May. After the fire of London, 1666, he rebuilt many houses and churches in the city, including 1672, 16 Oct. the church of S. Stephen, Walbrook, with Christopher Kempster as assistant; 1675 new front of lord Craven's house at Hempstead Marshall, Berkshire (perhaps under capt. W. Wynde); 1677 church of S. Bennet, Paul's wharf; 1680, S. Austin's by S. Paul's; and others. In 1675 he commenced rebuilding the cathedral of S. Paul, and on 21 June 1675, he laid the first stone with his own hands (also said to have been laid by sir C. Wren).

Thomas died Midsummer 1681 leaving all to his brother EDWARD, born 1652, citizen and mason, who continued and completed S. Paul's, under sir C. Wren; 1683-4 house for king Charles II at Winchester, under sir C. Wren; a house in the market place at S. Alban's (BUCKLER, p. 165); 1694 hospital at Blackheath for sir John Morden; 1696 Greenwich hospital; with many other churches named in CLUTTERBUCK: and 1705-12 with his son Edward he commenced Blenheim, Oxfordshire, under sir J. Vanbrugh. In 1714 he bought the manor of Hyde, Abbots Langley, Hertfordshire; died 8 Feb. 1723-4, aged 71, at New Barnes, and was buried in the church of S. Peter in S. Alban's. The epitaph is given in CUSSAN, *Hist. of Herts*, 1881, p. 299-301; and BUILDER *Journal*, 1864, xxii, 700. He left three sons, EDWARD; Thomas who died 26 Dec. 1736, aged 52; and John who died 16 Jan. 1737, aged 68.

EDWARD of Greenwich, citizen and mason, assisted his father in rebuilding many of the London churches; 1706 began the lantern of the dome of S. Paul's, the last stone of which was laid by his father 25 or 26 Oct. 1708 (by C. Wren in the presence of the two Strongs, *Parentalia*, 293); and did all the marble paving; 1715 he rebuilt the old tower of the church of S. Michael, Cornhill, under sir C. Wren; and the north front of Canons, Middlesex, for the earl of Chandos (JAMES; PRICE; GIBBS). His will is dated 22 July 1741, and was proved 20 Oct. 1741. No sons. CLUTTERBUCK, *Hertfordshire*, fol. 1815, i, 167. DUGDALE, *S. Paul's Cath.*, fol. 2nd edit., 1716, p. 172. BLACKER, *Gloucestershire Notes and Queries*, 8vo., London, 1884, ii, 262; who iii, 365, mentions (from *Notes and Queries*, 7 Ser., i, 228) a portrait by sir G. Kneller, at Shaloch, Aberdeenshire. GOULD, *Freemasonry*, 4to., 1884, p. 40-3.

STRONG ROOM. A space specially built fireproof, and sometimes thiefproof, to contain valuables and documents. For ordinary purposes, a room built with a wall 14 ins. thick with a proper fire-resisting door is a good protection from fire. For larger buildings, a system of double walling, 14 ins. outside, a space of 6 or 9 ins., and inner wall of 9 ins., with a second wrought iron door; CHUBB, at INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1849, viii, 154. CHUBB, *Protection*, etc., 8vo., London, 1875, p. 57. Half an inch thickness of clay and sand intercepted the heat of a mass of eleven tons of white hot melted cast iron for twenty minutes without the heat on the outside of the vessel being sufficient to pain the hand; CIVIL ENGINEER, etc., *Journal*, 1847, x, 94.

Where security from fire is the chief object, the thickness of the brick walls and covering, the avoidance in its construction of any material not completely fire-resisting, such as most kinds of stone, granite, etc., which perish under the action of fire, and

a good fire-resisting iron door are most important points. It is convenient that there should be an iron gate within the fire-proof door, thus permitting the latter to stand open during the day for ventilation. The strength of the vaulting or covering is of great importance in order that it may resist the impact of falling beams or walls. The whole should stand on a solid mass of cement concrete and be completely protected from moisture, absolute dryness being essential. When the strong room is intended to be also *thief proof*, not only must the thickness of the walls be increased, but they must be also fortified by building-in of iron bond in every course with stout vat hooping or bars at intervals. The walls must be carried down to a sufficient depth to prevent their being undermined, and the whole surface below filled in with cement concrete, so that the strong room may not be entered from below the floor within the longest period of time the place is likely to be left unwatched, and special burglar-proof iron steel-lined doors are essential. The *bullion* room and the inner portions of the strong room, should be lined with hardened steel plates, and special precautions taken to resist the skill and perseverance of those who would be likely to attack it with tools of the highest excellence specially designed for overcoming resistance; and within these rooms, fire and thief-proof safes give further security. In banks and commercial establishments, the iron safes which contain the books and documents in daily use, are sometimes raised from the strong room in the basement to the ground-floor level by hydraulic or other lifts.

BUILDING NEWS *Journal*, 1870, xviii, 294. BUILDER *Journal*, 1847, v, 567, at Hulme, Manchester, costing £400. By S. Benthams, v. 581. *To get it dry*, 1862, xx, 68, 73. A room by Chubb and Son, 1865, xxiii, 171. WHICHCORD, *National Safe Deposit Company's premises*, read at R.I.B.A., 17 Jan. 1876. *Chancery Lane Deposit*, B. J., 1885, xlviii, 671, 712. BANK. SAFE. FIRE-PROOF. Messrs. Chubb and Son made for the Argentine Republic a room, noticed in BUILDER *Journal*, 17 Feb. 1883, and BUILDING NEWS *Journal*, 16 Feb.: their last and most important steel strong room made for the National Bank of Scotland was noticed in B. J., 12 Sept. 1885; B. N. J., 11 Sept.; ARCHITECT *Journal*, 12 Sept.; and ILLUSTRATED LONDON NEWS, 26 Sept. Messrs. Hobbs, Hart, and Co. have made strong-room work at messrs. Drummonds; Cox and Co.; Herries, Farquhar, and Co.; Alliance; London and Westminster; Coutts and Co.; Bank of England and its branches, with the Law Courts branch, now in hand.

STROPHIUS. The Gr. term for the Lat. *cardo*, a hinge.

STRUCK. The term used to denote the removal of any temporary support during the execution of a work. STRIKING. 1.

STRUCK JOINT. The joint of brickwork formed by the points of the trowel in the mortar as the work goes on.

STRUCTURE. A construction, as a building, wall, etc. Anything to which the term "built" can be applied. PARTY STRUCTURE. PARTY WALL. 25.

STRUDEM (PAOLO, DOMENICO and cav. PIETRO), of Verona, sons of Bartolomeo, also sculptors, practised *cir.* 1680 at Vienna and in Germany. 39.

STRUT. A sort of truss to porches of old houses; see SPUR. Also the brick, stone, and iron constructions formed to retain the sides of deep cuttings in clays and other uncertain soils; as explained with illustrations by HOSKING, at INST. OF CIVIL ENGINEERS, printed in CIVIL ENGINEER, etc., *Journal*, 1845, viii, 209-13. SHORE.

STRUT (Fr. *étais*; *étréillon*; *feuton*; *contrescriche*; *décharge*). A stay, to support something else, as a head or post, in position and also to stiffen it. The diagrams L and P under BRACE, will explain the difference of these two terms. Tables for wood and for iron struts of various forms are given in HURST, and in RANKINE. Also called "stretching piece", being a piece of timber placed obliquely in the framed part of a building, serving to keep a main beam in its position. MOXON, *Mechanick Exercises*, 4to., 1694, p. 162, explains a "strut as a strong brace or dragon beam that stands under a bressummer, meeting in

an angle upon the shoulder of the kingpiece", as in illustration. SHORE. VIOLLET LE DUC, *Dict. Rais.*, s. v. Construction, p. 160-3. The use of the diagonal tie, or brace, or strut, was extensively introduced into naval architecture by sir R. Seppings, perhaps the first great departure from the antiquated mode of ship-building, as it gave increased stiffness vertically and horizontally. Struts are used in roofs to support the rafters and the straining piece. 1. 4. 19.

STRUT BEAM. Explained in MOXON, p. 143, as the same as "a topbeam, collar beam, and wind beam." Also STRAINING PIECE.

STRUTTING, called DWANGING in Scotland. A contrivance to stiffen floors and to prevent their springing, invented since thin joisting and plastered ceilings, while the joists are of greater depth. It is often called "herringbone strutting"; "bridging" in Lancashire and Dublin; also "drumming". Two pieces of wood each about $1\frac{1}{2}$ ins. by $2\frac{1}{2}$ ins., are nailed crossing each other, in a row across the floor, about 4 ft. or more apart, to the sides of the joists, thus preventing the joists twisting in their length as a moving weight passes over the floor. Also a solid piece of wood the depth of the joist driven in between them and spiked. Single joisted floor of wide span can be strengthened by iron bolts passed through on the lines of this strutting, and screwed up tight.

STUART (père BERHARD). A native of Scotland, entered the Scotch Benedictine monastery at Regensburg. He stopped some years at Augsburg to study waterworks, and there designed 1739 the lecture hall for the jesuits, which was decorated by Bergmüller. 68.

STUART (JAMES), F.R.S.; F.S.A.; born 1713 in Creed Lane, London, was son of a Scotch mariner. Taking early to drawing and almost self-instructed, he was soon employed by ... Goupy in painting fans, and instructed his two sisters and a brother at like work. In 1742 he set out through Holland and Paris to Italy to study painting. At Rome where he resided for about 7 years he wrote *De Obelisco Caesaris Augusti*, fol., Rome, 1750, which was published at the expense of pope Benedict XIV. In January 1751 with Revett, architect, and W. Pars, painter, he left for Greece, visiting Venice and Pola; at Athens he measured and drew the ancient works, and leaving Revett there he returned 1755 to England. The first volume of *The Antiquities of Athens*, fol., London, 1762, gained him high honours with the name of "Athenian Stuart": the second volume though dated 1787 was published 1788 by his widow with the assistance of W. Newton and J. Wyndham in the text; a third volume edited by W. Reveley in 1794; and a supp. vol. by J. Woods appeared in 1816. Another supp. vol. edited by W. Kinnard was published 1830. A French edition was edited by J. J. Hittorff. The prospectus for the *Antiquities* was sent 1751 by Thomas Hollis at Venice to prof. Ward, with an account of Stuart's travels; printed in CAMDEN SOCIETY, *Letters, etc.*, 4to., 1843, p. 379-89; 393. His other literary works are said to be *Critical Observations on the Buildings and Improvements of London* (Anon.), 4to., 1771, two editions of same year; and *Pictorial Tour*, 4to., 1793, with plates by him.

He designed Lichfield house, No. 30, S. James's square, for lord Anson (the Clerical, etc., Life Assurance company since 1856); at Shuckburgh or Shugborough, Staffordshire, the seat of lord Anson, he 1764 erected a façade, as a monument, of the arch of Hadrian, repeated the octagon tower of the Winds, the choragic monument of Lysicrates, and other buildings (NEALE, *Seats*, 1820, iv); this patron obtained 1758 the appointment for Stuart of surveyor to Greenwich hospital which he held to his death. He designed 1763 the infirmary, (W. Robinson, clerk of the works); and restored in the Greek style the interior and roof of the chapel after the fire of 2 Jan. 1779, cost £80,000 (MALTON, *Tour*, 1792); 1783 the boys' school and dormitory (W. Newton, clerk of the works at the three). He designed Belvidere, near Erith, Kent, for lord Eardley; 1760 house at the north-west angle of Portman square for Mrs. Montague; 1760 some parts of the

interior of lord Spencer's house and the front in S. James's place; 1782 Atcham or Attingham hall, Shropshire, for Thos. Noel Hill, lord Berwick (NEALE, *Seats*, 1826, 2nd ser., iii); his own house No. 45, Harley street; and several tombs in Westminster abbey; that to Mrs. Mason (by Bacon) in Bristol cathedral; and that to lady Cath. Powlet (died 1 Oct. 1774) wife of Adam Drummond, in Greyfriars churchyard, Edinburgh (SCOTS MAGAZINE, 1776, xxxviii, 496); and many medals including that of the Society of Arts, etc.; he also executed some engravings. He did not exhibit at the Royal Academy. A volume of 20 views in body colours drawn by him for the *Antiquities*, is now in the library of the Royal Institute of British Architects.

He died 1 or 2 Feb. 1788 aged 75, leaving four (one had died) young children, and was buried in the vaults of S. Martin's in the fields (he was then living in Leicester square). James, one of the sons, in the navy, died at Stratford, Essex, 6 Sept. 1867, aged 80: his youngest son is said to have been an architect. The best memoirs are by J. Woods in Supp. Vol., 1816, xxi; and GENTLEMAN'S MAGAZINE, 1788, lviii, 95, 181, 216; lxxix, 596; lxxxvii, i, 517. Other references.—EUROPEAN MAGAZINE, xiii, 68, 143, 284; xlv, 369. KNIGHT, *English Cyclopædia* (Biography), v, 794. NOTES AND QUERIES Journal, 2nd Ser., ii, 80, 100; ix, 201, 231; xi, 163; 3 Ser., ii, 275. MULVANY, *Life of Gandon*, 8vo., Dubl., 1846, p. 195-9. CIVIL ENGINEER, etc., Journal, 1847, x, 338.

STUBBING. Inserting an iron spike or standard into a hole made in a stone to receive it, and into which it is usually plugged with lead, or cement. In the former case steam is often created, which is considered by some to crack the stone, as perhaps confirmed by PATTE, *Monumens*, fol., Paris, 1765 (1767; 1797), p. 133 note. "Capping with copper cramps and stubbs run with lead." DOG. JOINT. SULPHUR. It is also the operation of digging up the root stem of a tree.

STUB NAIL; sometimes called a "chisel-pointed" nail. A nail laid cold upon the arris of an anvil and struck in two by the blow of a hammer; by thus getting rid of the point the remainder of the nail is strong enough to enable it to be driven into hard wood. R. R. R.

STUCCATO (It.); see RELIEF; STIACCIATO.

STUCCO. (It. *stucco*; Sp. *estuco*; Fr. *stuc*.) A term of doubtful origin, but which may be derived from the Sp. *estuco* from some Constantinopolitan word for the sticky ground of mosaics (VASARI, *Lives*, edit. 1851, ii, 68, s. v. Alessio Baldovinetti, died cir. 1499), such as *στούχος*, a row, line, or rank, from *στέλλω*, rather than from *ἑσθη* or other derivation. Also said to be the Italian word; *stuccatura*, was applied to all interior ornamental work in imitation of carved stone.

VITRUVIUS, vii, 2, De maceratione calcis ad albaria opera et tectoria perficienda; and 3 and 4 relate to the "Stucco work", and to its use in damp places; and 6 to the marble. The lime is to be of the best quality and tempered a long time before use. With three sand coats and three coats of marble dust the walls will be rendered solid and not liable to cracks or other defects.—Some persons cutting slabs of plaster (? stucco) from the ancient walls use them for tables—being of themselves very beautiful in appearance. The term ALBARIUM OPUS, is now considered to be a setting coat of pure white lime not intended for paint. The ancients had the art of preparing stucco in great perfection, and rendering it almost indestructible. They used it not merely for coating rooms, but to cover brick columns, stone, marble, or limestone of the coarser kind, when it was applied only as a thin incrustation; ROYAL INST. OF BRIT. ARCHITECTS, *Proceedings*, Dec. 1886, p. 65. PLASTER WORK. The stone of the temples at Selinus previous to cir. B.C. 408, where it remains perfect in many parts, and shows portions painted: at the temple to Zeus at Olympia, a shell conglomerate, called *poros*, by PAUSANIAS, of the Doric order, contemporary with the Parthenon; the Roman stucco at Braiga, upon a rock-excavated chamber stands, although the wall has perished;

BRECHEY, *Proceedings*, 4to., London, 1828, p. 226. The stucco for coating cisterns appears to have been composed of five parts of sharp sand and two of quicklime mixed with flints and well beaten; and a fine white stucco or cement made of marble which still, as it is seen at *Pompeii*, retains great hardness; LIB. OF ENTERT. KNOWLEDGE, 8vo., i, 102; ii, 24; 87. A thin coat of stucco on a stone cap; and a thick coat of plaster on a brick shaft, are noted by DONALDSON, *Pompeii*, fol., 1827, p. 54. The interior of the walls of the ancient cisterns at Alexandria are covered with a thick red stucco that is not permeable to water. ANDREOSSY, *Constantinople*, 8vo., Paris, 1828, i, 472, describes the mortar of lime and sand, of lime and khoracan (cement), and cement for interior of conduits, etc., also giving from CODINUS, by LEBEAU, *Hist. du Bas Empire*, ix, 496, the cement used in building Santa Sophia. "Stuc" is described in BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 158, as best composed of sand 84 livres, lime 12, milk curdled 4, and water 10, quoting *Bibl. britanniq.* No. 38. He refers to the museum of the hôtel royal des Monnaies, to India, and to Egypt.

The mediæval builders used a plaster or stucco, which retains its hardness to the present day, as in the crypt of S. John's church, Clerkenwell, whereon the colours still remain. The insides of many buildings were finely plastered. BUCKLER mentions its use outside, at S. Alban's cathedral; and SCOTT, *Lectures*, 1879, ii, 98. At the church at Germigny (Loiret); DALY, *Revue Générale*, 1849, viii, 117; other references, x, 248; 251. A stucco is noticed as used at Guisborough, in WALBRAN, *Guide to Redcar*, 1848; and in *ARCHÆOLOGICAL JOURNAL*, 8vo., 1848, v, 169. 1485 dawber terysing (terrassing) of floris 8d. per day; NICHOLIS, *Manners, etc., Accounts of S. Mary Hill, London*, 4to., London, 1797, p. 94. Stucco work was in great esteem during the Elizabethan period. ROUGH CAST. FRETWORK. ENTAIL. PHRYGIUM OPUS. SHAM. VENETIAN.

VASARI, *Lives*, notices the discovery of stucco for mosaic work by A. Baldovinetti, *cir.* 1480; that B. Pinturicchio for pope Alexander V (1492-1503) worked ceilings in stucco work, but the material not being good it is in ruins (*idem*, ii, 289); that Francesco called L'Indaco (xv-xvi cent.) finely and richly ornamented an escriptorio with stucco (*idem*, 347); that Bramante Lazzari, *cir.* 1504, designed at Rome, a palazzo for Raffaello, of brick with stucco work cast in moulds, an invention quite new (*idem*, 437); and that G. Nanni da Udine, 1513-20 invented the stucco in which he executed the grotesques in the loggie of the Vatican, being a composition of lime and marble powder, ever since adopted. Before his time, many had made a stucco of gypsum, chalk, Greek pitch, wax, and pounded bricks—then limestone and puzzuolana was used for ornaments—then travertine—and lastly whitest marble ground to fine powder, carefully sifted, and mixed with lime from white travertine, thus producing the stucco of the ancients (VASARI, edit. 1852, iii, 45; v, 20; DE PILES, *Art of Painting*, 3rd edit., 8vo., 1754, p. 134); Seb. del Piombo, died 1547, discovered that a plaster made of pitch, mastic, and quicklime, prevented oil colours on walls from changing (DE PILES, p. 144); Primaticcio, *cir.* 1524 executed ceilings at Mantua; with many later notices of its use in Italy. Most of Palladio's edifices are erected of bricks stuccoed; many of the "marble palaces" of Venice and Rome are so faced. POZZI, *Sculptoria, vulgo Stuccatoria artis paradigmata*, fol., Aug. Vind., 1708, 9 pl. of ceilings, no text.

1666 May; "If there be use of stucco, I have great hopes, from some experience already had, that there are English materials to be brought by sea at an easy rate, that will afford as good plaister as is any where to be found in the world; and that with the mixture of cheaper ingredients than marble-meal, which was the old, and is now the modern way of Italy"; WREN, *Parentalia*, fol., 1750, p. 277.

GIBBS, *Architecture*, fol., 1728, notices that "the Hall is to be finished in stucco" (p. x); the fronts of rough stone finished with stucco (p. xi); the dressings of stone of brick finished

ARCH. PUB. SOC.

over with stucco (p. xvi); and ornaments of the inside are to be of plaister and the outside of stone (p. xviii). Stucco is called "finishing", in MORRIS, *Lectures*, 8vo., 1734, p. 116. In 1736, "Stucco or Stuc" is described as "made of pulverised (white) marble mixed with plaster (of lime), the whole well sifted, wrought up with water, and used like common plaster. Of this are made statues, basso-relievos, busts, and ornaments of architecture." (This was reprinted in ELMES, *Dict.*, 8vo., 1826.) "For figures, the last coat is made of 1 lb. marble dust and 3rds lime. Some stuc is made of plaster stone managed as marble or alabaster. Stuc ornaments are made of a composition neither too hard nor too soft, and then a prepared mould is pressed or struck upon it, and when removed, the surface is cleaned by hand.—The moderns consider that plaister of lime and sand does not dry so soon as stuc for painting on, and being greyish is more proper than so white a ground for colours" (NEVE, *Dick*).

The stucco of the xviii cent. used for internal decorative purposes, was a composition of very fine sand, pulverised marble, and gypsum, mixed with the requisite quantity of water. After a short time it begins to harden and is then moulded or worked with metal tools. CARTON PIERRE; PAPIER MACHÉ; etc., has now taken its place. STUCCO is now a species of plastering, occasionally worked to resemble marble. One sort is made of lime, the other of plaster; the former is called CEMENT, and is more useful where humidity is concerned, than in decoration: the latter is made of lime mixed with chalk, plaster, and other substances, and can be coloured, painted, and polished. BASTARD STUCCO is three-coat work; 1, roughing in or rendering; 2, floating; 3, setting coat having a small quantity of fine sand or hair, not hand-floated. TROWELLED STUCCO, the best sort of plastering for paint is three-coat work; 1, rendering; 2, floating which should be very smooth and as dry as possible before the stucco is put on; 3, setting coat in which the hand-float is used with much care and labour, being moistened with water as the work proceeds in about 4 or 5 ft. square spaces, until the whole forms a fine even surface as smooth as glass. As an imitation of stone, much will depend upon the skill and care with which the stucco is executed, and it should be lined vertically and horizontally to show courses.

—Appeal on the right of using Oil Cement or Composition for Stucco, 8vo., 1779 (see ADAM and LIARDET). The Italian method, etc., of using stucco is noticed in GWILT, *Encyclopædia*, edit. 1867 and 1876, p. 678. "Baylaying" or stuccoing a façade at Brighton, *BUILDING NEWS Journal*, 1860, vi, 563. Stucco-work in Dublin, was 1865 stated to be now used for plasterers' work; also for cast in plaster. SPARING. DEPRETER. Oil cements, see CEMENT and MASTIC. IMPASTATION. PLASTERERS' WORK. INTONACO. 1. 2. 4. 6. 14. 25.

STUCCOER. The artisan who worked in stucco, which work was either done by the hand on the walls or ceilings; or the running patterns were put up in plaster, and lead or resin moulds pressed or forced into it, and then cleaned up by hand.

List of stuccoers besides those named in the above article: PLASTER WORK (p. 131). This branch of ornamental art is no longer carried on.

B. Ridolfi, died about 1550.
Giov. Nanni, d. 1564.
Leo. Ricciarelli, about 1570.
Luca Romano, about 1586.
Arudini, about 1640.
Branchi, about 1640.
Roucaoli, d. 1660.
G. F. Bezzi, d. 1690.
G. B. Artario, about 1700.
G. B. Genone, about 1700.
A. Disegna, d. 1710.
S. Busi, d. 1730.
A. Stazio.

M. Costa.
— Clerici, about 1745.
C. Mazzetti (Tenchola), ab. 1750.
B. Rossi.
G. Artari (died 1769) and —
Bagutti worked for J. Gibbs
from 1721.
— Wilton, 1750.
P. Naldini.
S. Richter, *cir.* 1770.
Thos. and Charles Clarke, 1783.
Wm. Collins, d. 1793.
J. Papworth, d. 1799.

STUCK. "Mouldings are stuck upon the edges of stuff to

ornament it, as on chimney pieces, window frames, etc."; MOXON, *Mechanick Exercises* (Carp.), 4to., London, 1694, p. 165. STICK.

STUD (Fr. *potau de remplissage*). Somersetshire SPEARING PIECE; Uprights; INTERQUARTER; QUARTERS in Lancashire. "Stedes" (or studs) to put in the walls, 1557; CAMDEN SOCIETY, *Ludlow Papers*, 4to., 1867, p. 79. The posts, or quarters, in timber partitions and placed about 11 or 12 ins. apart according to the length of the laths for plastering; the spaces between being left open. BATTENING. REED. STOOTHE. PRICK POST. STORY POST.

STUD FARM; see STABLE.

STUDIO. The house, or often only a room, in which an artist exercises his profession, but the term is generally applied to a PAINTING ROOM, under which head it has been described. Although a studio has to be considered under various aspects, yet these aspects may be divided into three; viz., the essential requirements for a painting room; the modifications necessary for the speciality of the artist; and the requirements for the tastes and habits of the particular man: few artists are quite satisfied with what they have. The studio of sir Joshua Reynolds was octagonal, about 20 ft. long, 16 wide, and 15 ft. high; the window small and square and 9 ft. from the ground. Amongst the more modern buildings are

- G. Aitchison, A.R.A.; for sir Fred. Leighton, P.R.A., No. 2, Holland park road. Two for P. H. Calderon, R.A., one at Marlborough place; the other at Weston lodge, Grove end road.
W. W. Deane, for late Fred. Walker; and a nest of studios for ... Topham, King Henry's road; and for F. W. Topham, Adelaide road.
F. P. Cockrell; several. R. N. Shaw; several. P. Webb; for Val Prinsep.
P. C. Hardwick; for sir J. E. Millais; s.v. Painting room.
E. W. Godwin; for J. A. M. Whistler; given in *BRITISH ARCHITECT Journal*, 8 Dec. 1878, and 24 Oct. 1879; for Stuart Wortley, 9 Nov. 1878, and 4 July 1884; for F. Miles, 6 Dec. 1878, and 11 June 1880; for Rose Corley, 8 Oct. 1879; for H.R.H. Princess Louise, 3 Dec. 1880, p. 238; the Artists' Houses, Chelsea, for Stuart Wortley, J. Whistler, and Slingsby Bethel, 14 May 1880.
H. Field; two, described s.v. Painting room.
T. W. Cutler; for T. W. Smith and J. O'Connor; two residences, etc.; Abbey place, S. John's wood, £7,000; *BUILDING NEWS Journal*, 1878, xxiv, 54 and plate.
W. Burges; "An Architect's house"; *BRITISH ARCHITECT Journal*, Jan. 4, 1878.

The university of Padua was originally called the "studio", and celebrated as early as 1221 when Frederick II commanded the students of Bologna to resort to it. "Studios" of collected works comprise Tenerani; Gibson of Rome, now at the Royal Academy of Arts, Burlington House; Wyatt at Rome; Schwanthaler at Munich; Rauch at Berlin; Chantrey at Oxford; Thorwaldsen at Copenhagen; sir John Soane, London; Schinkel at Berlin.

STUD MOULDING. A unique ornament, somewhat similar to the BAIL FLOWER, occurs in a string course over the north aisle in S. Mary's church, at Beverley; and a smaller one in the chancel, engraved in ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1865, p. 109; and in RICKMAN, *Attempt*.

STUDWORK or stud-building; or BRICKNOG. A partition or thin wall consisting of "studs" with the space between them filled in with brickwork. It is stronger than when formed with timber only. HALF TIMBER. At Glastonbury it was used very early. "In the open ohampaign countries the dwellings, for want of that stuff (timber), no studs at all are used, but only frank post, raising beams, groundels, summer-beams, transoms, and such principal timbers, with here and there a beam, whereunto they fasten their radels, which they cast all over with thick claie, sometimes white with chalk, at others with red loam, and some with blue like slate"; HOLINSHED, *Chronicles* by HARRISON, etc., fol., 1574-86. To colour and preserve (for years) the exposed studwork, melt 12 oz. of rosin in an iron pot, add 3 gals. of train oil and 3 or 4 rolls of brimstone; when melted thin, add as much Spanish brown, or brown ochre, ground fine, and as much of the oil as will give your colours. Lay it on with a brush as hot and thin as

possible, and some days after the coat is dry, lay on another; LOUDON, *Agriculture*, 1831-43. 1.

STUDY (Lat. *studii*; Fr. *cabinet*). The simplest form is a place of reading and writing for one person alone. The student should be able to sit comfortably at the desk as regards fire-place and door and have a front left light; a bookcase is the best back. For a scientific man, the study must be necessarily contrived with special reference to his objects, with such adjuncts as he may dictate; KERR, *Gentleman's House*, 8vo., 1871, p. 123. The records of Bills in Chancery were in the custody of the six clerks and the sworn clerks who kept them in "studies" or "record houses"; these are mentioned as existing *temp.* Charles II (1660-85) and were continued until 1842. The clergyman's study should be of easy access from a side entrance for parish business, and so as not to interfere with the family entrance.

"In quodam armariolo suo vocato 'his studdy' in predicta domo manciionali vocata 'Essex House' habuit diversos libros", etc. The furniture was as follows: "In the late Earle of Essex his study: Item one little Table, iij.s. iiij.d.; Item one redd velvet Carpett & one turkye Carpett, xls.; Item one payre of Andirons one fier shovell & tongis, viijs.; Item one Skreene, viij.d."; RECORD COMMISSION, No. 1350 in Appendix to HARDY, *Report*, 1878.

STUELER (AUGUSTE), born 28 Jan. 1800, became a pupil of C. F. Schinkel. With J. H. Strack he published *Vorlegeblätter für möbel Tischler*, 24 pl., 1835 and 1846, of great service in Germany. In 1837-9 he designed with T. J. Schadow the S. Petri und Paul kirche at Nicolskoë (*Architektonische Album*, fol., Berlin, 1838); designed 1840 the rathhaus at Perleburg; and *landhaus* at Bodensee (*ALLGEMEINE BAUZEITUNG*, 1843, pl. 518). About 1838 at S. Petersburg he designed with J. H. Strack the railway stations first erected (*Abfahrtsgebäude*, in *Architect. Album*, fol., 1838); and 1838-9 the new winter palace (but query); 1840-44 designed the exchange at Frankfurt on Main (*Die neue Borse*, fol.), published *Entwürfe zu Kirchen, Pfarr und Schulhäusern*, etc., 72 pl., fol., Potsdam, 1844-50; 1845 carried out from the design of Schinkel the dome to the S. Nicolaikirche at Potsdam; and from that of Persius the Friedenskirche at Sans Souci was carried out by Arnim under Stueler; 1846 visited Rome. At Berlin are many houses, also some pretty villas outside the Brandenburg gate, and among other designs by Stueler are the following; two dwellings given in ALL. B., 1843, pl. 519; *ARCHITECT Journal*, 1850, ii, 198; 1844 began the new church in the Zoological gardens with a baptistery to correspond with the sacristy; 1843-48 the new museum connected with the original or old museum (in pt. i of *Architect. Album*, fol., 1850; and 1862; general plan in A. B., 1843, pl. 522); 1843 the church of S. Matthäus near the Thiergarten; and 1846 that of S. James; 1845 published *Bericht über die Einrichtung, etc.; neuer Kirchen in England*, 8vo.; 1846-7 restored the palace of the minister of war in Leipziger strasse; 1847-54 designed the new royal chapel, carried out by Schadow; the schloss Hohenzollern; 1854 S. Mark church in the Weberstrasse; 1859-6 the new cathedral (*BUILDER Journal*, 1859, xvii, 504-5); the exchange; 1860-63 the national museum at Pest (B. J., 1876, xxxiv, 811); and the château of the grand duke of Mecklenbourg-Schwérin. He became hofarchitect and later oberbaurath. He died 18 March 1865, aged 66, at Berlin. 68.

STUFF. Material used in plastering, FINE STUFF for last coat, or slaked lime with a little fine sand or hair. COARSE STUFF, or lime and hair. GAUGE STUFF, or gypsum and fine stuff; SETTING COAT. STUCCO, or fine stuff and sand, well worked.

• STUFF. In carpentry, "all the wood the joiner works upon", 1736. A general term for the wood used by joiners and carpenters, as boards, INCH STUFF, etc. The usual size of "stuff" used during the mediæval ages is noted in GWILT, *Encyc.*, edit. 1867 and 1876, § 2175d, p. 646; p. 944-5.

STUMP. A popular term applied to the steeple of Boston church, Lincolnshire, on account of its abrupt termination as seen from a distance. "Stump cross" is applied in Lancashire to the small boundary cross, now generally dilapidated. "Stump tracery" to a variety of tracery which appeared in the late Gothic styles on the continent; **PERPENDICULAR**; **FLAMBOYANT**. 19.

STUNNING. Taking off the surface of a stone in restoring or repairing a building; **DURHAM**. **SKINNING**.

STUPAS. The tope of the Buddhists; a construction erected to mark some sacred spot or to commemorate some event. Of the stupas at Buddh Gaya, erected before the beginning of vi cent., "its straight lined pyramidal nine-storeyed temple, retaining all its essential forms—anomalous and unlike anything else found in India, either before or afterwards, but probably the parent of many nine-storeyed towers found beyond the Himalayas, both in China and elsewhere"; **FERGUSON**, *Indian, etc.*, Arch., 8vo., 1876, p. 57-83, with cuts, etc., of the Bhilsa tope (some sixty); at Sanchi; Bhojpur, etc.; at Sarnath near Benares, and in Behar; at Amravati; the Gandhara tope; Jelalabad tope, one as late as vii cent.; and at Manikyala; with their interesting rails. In writing of Nepal, the same author describes (p. 302) the "stupas or chaityas" of that country. **CUNNINGHAM**, *The Stūpa of Bharhut: a Buddhist monument*, iii cent. B.C., 4to., 57 phot., 1879. **SOCIETY OF BIBLICAL ARCHAEOLOGY**, *Proceedings*, 8vo., Lond., 1886, p. 84.

STURM (**LEONHARD CHRISTOPH**), born 1669 near Nuremberg, was the son of the mathematician John Christopher Sturm. He was professor at Wolfenbüttel and at Frankfurt on the Oder, and afterwards court architect at Schwerin, and then at Brunswick, where he made the design for the palace of Salzdahlum, considered magnificent of its kind and long famed for its picture-gallery. He invented a new capital which he called the "German" order; and published several works 1694-1720; some later ones were perhaps by a son. He died 1719 at Blankenburg where a memorial was erected in the church of S. Bartholomew. 68.

STUTTGART. The capital of the kingdom of Württemberg. It is entered by eight gates, and consists of the old or inner town, the upper or rich town, outer or Essling town, with the streets and suburbs built by king Frederick. An iron statue to Schiller 1839 by Thorwaldsen (**ALLG. BAUZEITUNG**, 1839, pl. 295); 1841 the jubilee column of granite 59 ft. high. The *stiftskirche* 1419-31 (**WEBB**) or 1434-1578; the great tower 1490-1531, had the interior restored 1841-3 by C. von Heideloff, who published a description in his *Kunst in Schwaben*, 4to., Stutt., 1855, p. 14-34, and notes the eleven statues 1574-93 in the choir; the hospital kirche, completed 1471, tower 1738, was restored 1835-41; it retains the original sedilia, a very rare feature in continental churches (**WEBB**; **ECCLESIOLOGIST Journal**, 1848, p. 157); S. Leonard, late third pointed (**WEBB**); S. John, by ... (**BUILDER Journal**, 1876, xxxiv, 929); 1864-5 English protestant church of S. Catherine, by T. Smith and Son of London; the Munich glass cost £2,000; (*idem*, 1866, xxiv, 232-3); with some others since about 1876; and 1862 the gorgeous synagogue.

* The old palace 1553-70, resembling a feudal fortress, now occupied by court officials; in the court is an equestrian statue of count Eberhard 1496, by Hofer 1859. The new palace in a park 1746-1806, a large plain stone edifice containing 365 rooms; the interior is richly decorated and furnished; the *liebstall* or royal stud house adjoins it. Among the other buildings are;—the prinzen palast, now hôtel for foreign affairs; 1879-82 law-courts 300 ft. long; the ständenhaus or states house; new archiv or record office; * town house, xvi cent., (No. 7 near it is dated 1512); 1865 school of science and art by Egle; 1860 Königsbau, concert-rooms, exchange, etc., by Liens; 1827 new natural history museum; 1765-1820 public library of about 300,000 vols.; royal cabinet of medals; 1843 museum of fine arts by Barth; the showy theatre or opera house, one of the largest in Germany, by L. P. Guepiere (?), redecorated 1845-6 by L. Zanth; new hospital; Katharinenstift or school for girls

founded by grand duchess of Oldenburg, died 1819; new barracks, one 1828-42 for 3,000 men; one for cavalry 1840-5, and another; military academy *cir.* 1800, by R. F. H. Fischer; officers' old pavilion now occupied by polytechnic school; mar-stall or stud-house for about 300 horses of good breed (**ALLG. BAUZ.**, 1867, pl. 51); neue Personenbahnhof, by Morlok (*idem*, 1867, pl. 51-7); gymnasium formerly military academy, resembling a palace; Alte herzogliche lusthaus, by A. Kostlin (*idem*, 1870, pl. 38-48); and Wohnungen für Bedienstete der kgl. Verkehrsanstalten (workmen's village), by ober. von Morlok (*idem*, 1874, pl. 79-89). 1816 J. G. Klinsky was appointed hofbaumeister.

L. LANGE, *Ansichten von Deutschland*, fol., 1857, gives the market-place. **RACZYNSKI**, *L'Art Moderne*, 4to., Paris, 1836, ii, 477-86. **FISCHER**, *Das Königreich Würt.*, 1838. *Der Wegweiser für Kunst, etc.*, 8vo., Stutt., 1840. **PFAPF**, *Geschichte der Stadt Stutt.*, 8vo., 1845-6. **MEMMINGER**, *Beschr. von Würt.*, 8vo., St., 1841. *Stuttgart und seine schens würdigkeiten*, 16mo. (1862). **LÜBKE**, *Geschichte der Deutschen Renaissance*, 8vo., Stutt., 1873, p. 348-77, being vol. v of **KUGLER**, *Geschichte der Baukunst*, gives several cuts; some marked * in this article.

Near the town is Rosenstein, the royal summer residence 1824-6 by G. Salucci, for king William (died 1864) (A. B., 1838, p. 196-8). At Cannstadt, the very expensive Wilhelma palace, 1851 by L. ZANTH, *La Wilhelma, Villa Mauresque de le roi de W.*, fol., Paris, 1855. The central wagon works there by K. Binder (A. B., 1872, pl. 39-48). La Solitude, 1767 by R. F. H. Fischer. Ludwigsburg, the Woolwich of the state: the château is one of the largest in Germany, erected 1730 for duke Eberhard Louis, by Frisoni and Retti (published in 28 pl. by Corvinus), succeeded 1752 by Guepiere, who published a description 1750: the two châteaux of "Mon repos" and "La favorita" are near. The palace at Berg, 1853 by Liens; old stone font in the church (A. B., 1871, pl. 21-3). The choir of the church 1450-1500 at Schorndorf is given in **KALLENBACH**, *Chronologie*, fol., Munich, 1847. **ESSLINGEN**. 14. 28. 50.

STY and **STYE**; see **PIGGERY**. Where hogs are kept by hundreds, sty-feeding and rearing is not adopted; the animals are allowed to roam about. In cold nights they crowd in "nests" when the weaker ones often get smothered. A "sifting shed", to face the south, is recommended to be formed of three compartments, the middle one for the largest hogs, on the right side for the smallest admitted by an opening at each end of the division walls; on the left side for the middle-sized hogs admitted by two openings of their size. **DOWNING**, *Cottage Residences*, 8vo., New York, 1842, p. 250-2. **HOG**.

STYLE of Art; or of Architecture. A term used by historians and art critics as a means to trace the development of art in its different stages of progress, improvement, and decline. **LOCAL MATERIAL**. It expresses the manner or character of any composition, or class of compositions, whether in architecture, painting, or music, etc. To say the Egyptian, Roman, etc., style of architecture or art, is correct; but it is commonly used with **Early English**, **Decorated**, etc., which is not strictly correct, *period* being the proper term to be used. The Royal Institute of British Architects in 1842 gave the subject, *On the effects which should result to Architectural Taste from the general use of Iron in the Construction of Buildings*; the essayist argued that a "new Style of architecture ought to arise from the introduction of a new material, etc."; and in 1842 *Are Synchronism and uniformity of Style essential to Beauty and Propriety in Architecture?*

The various countries and biographies of architects. **HISTORY**. **SCHOOL**. **LUSH**, *Style in Arch.*, **BUILDER Journal**, 1858, xvi, 865-7. **HALL**, *Propriety of Style, etc.*, **CIVIL ENGINEER, etc.**, *Journal*, 1843, x, 255-6. **WOOD**, *The Twenty Styles of Architecture*, 52 pl., 8vo., 1881. **ROUAIX**, *Les Styles*, 600 grav. classées par époques, 4to., Paris, 1886. **LEEDS**, *Outlines and Characteristics of different Architectural Styles*; in **WEALE**, *Quarterly papers*, 4to., 1843-5. **READE**, *Suggestions for the formation of a*

new Style, etc., fol. (1862): ROSENGARTEN, *Die Architekten. Stylarten*, 8vo, Bruns., 1857, transl. by Sanders, 8vo., Lond., 1876. 25.

STYLE (Gr. *στυλος*). This term, meaning a column, is extensively adopted by architectural writers in certain compound terms; as for columns to the front of a temple, as tetrastyle, hexastyle, decastyle, eustyle, and prostyle; also stylobate, etc.

STYLE or STILE. The upright supports of a frame; as Hinge or HANGING STYLE; falling or SHUTTING STYLE or meeting style, or middle, mounting, muntin, munting, or munnion.

STYLOBATE (Lat. *stylobata*; Fr. *soubassement* of VIOLET-LE-DUC). The substructure or basement of a temple below the columns, etc.; also the platform on which the building was elevated. It usually consisted of a series of steps continued all round the temple; or of a PODIUM or wall, which admitted access to the temple at one end only. J. T. Wood's theory of a stylobate to the temple to Diana, at Ephesus, 10 ft. high and extending 38 ft. each way beyond the bases of the columns, was discussed in FERGUSSON, *The Hypæthrum*, etc., read at Roy. Inst. of British Architects, 22 Jan. 1877, p. 81, 87-9, 95. The stylobate, the three great steps of the Parthenon (p. 104). Other instances occur, as at the temple to Juno Lucina at Agrigento; the Redentore and S. Francesco, by A. Palladio, at Venice; palazzo Vendramini; pal. Grimani, 9 ft. high; S. Francesco, at Rimini; pal. Pesaro; pal. Cornaro; Rievaulx and Bridlington; are mentioned by SMIRKE, in *Lecture*, 4 Feb. 1858, in *BUILDER Journal*. The Choric monument of Thrasylus at Athens. The hieron at Sbeitla, ancient Sufetula, as shown by GRAHAM, in Roy. Inst. of Brit. Archts., *Sessional Papers*, 1885-6. The circular temple at Tivoli stands on a stylobate about 5 ft. high. STEREOBATA; also FOOTSTALL; BENCH TABLE; PODIUM; BASE OF A WALL; DADO; GROUND TABLE; EARTH TABLE; PEDESTAL or plinth; LEDGEMENT TABLE. 14. 19. 25.

STYLUS or STILUS; see PEN.

STYRA. A town of Eubœa, situated at the northern foot of Mount Ocha, south of Eubœa, near Mycenæ, and famous for its quarries of Carystian marble; three buildings were discovered a few years before 1850, and are of the same nature as those described by WALPOLE, *Travels*, 4to., 1820, p. 285; one is peculiar for its roof being circular, of large squared blocks of various sizes, the roof of layers advancing to the middle, jutting out and not smoothed as at the so-called Treasury; RANGABE, at British Association, Aug. 1850, in *CIVIL ENGINEER, etc.*, *Journal*, xiii, 289. LEAKE, *Northern Greece*, ii, 422, 432. 23.

STYPERSTONE STONE. The quarries, which have been worked for upwards of half a century, are situated near to and north-north-east of Macclesfield in Cheshire. The stone belongs to the carboniferous measures period, and is probably the finest grained sandstone in the United Kingdom. It is obtainable in the largest sizes, there being sawing mills for landings up to 12 ft. by 8 ft. of any thickness. No. 1 grade of stone is of a uniform blue tint, and is used for sculptors' and tomb work, being somewhat softer than the other grades. No. 2 is of a blue tint but somewhat clouded or curled on the surface. No. 3 is of a brown colour. These two last are extensively used for steps, landings, etc., for public institutions, in churches, chapels, etc., in Cheshire and adjoining counties. It is of the same formation as the Greenmoor near Wortley and Sheffield; at which place the Victoria quarry lies in similar beds to the Styperstone. A. W.

SUANA, now SOVANA and Soana. An ancient city of Southern Etruria. The cathedral is a huge, gaunt, naked building; the castle, ruined in 1542, and other ruined buildings attest the once celebrated episcopal city, which stood a long siege in 1240, and from which in 1410 the Siennese carried off the great bell to their cathedral. The bishop resides at Pitigliano. The Etruscan tombs, etc., were discovered by ... Ainslie in 1843, who states that "no place contains so great a variety of sculptured tombs". Cliff-hewn sepulchres, great variety of architectural decoration, with mouldings so singular and so varied, showing

the characteristics of widely remote countries and of very different ages; DENNIS, *Etruria*, 8vo., London, 1848, i, 480-97. *ATHENÆUM Journal*, 1854, p. 750-1, No. 1390. *Annali dell' Istituto di Corr. Arch.* of Rome, 1843, p. 223-6, with Ainslie's drawings of the principal tombs. BULL. INST., 1843, p. 159-79. MON. INED. INST., iii, pl. 56, etc. GENTLEMAN'S MAGAZINE, Oct. 1843, p. 419. 23.

SUARDI (BAROLOMMEO). Agostino di Bramantino of Milan who executed paintings at Rome for pope Nicolas V (1447-55) was master, at Milan, of Bramante Lazzari who was in that city 1476 to 1499-1500 (DE PAGAVE, *Vasari*, edit. Siena) and was the master of Bart. Suardi, hence, it is said, he was called "il Bramantino". A "Bramantino" made drawings of old buildings which were studied by Lazzari. The church of S. Domenico 1469-1513 at Casale; the church and sacristy of S. Satiro (the interior and sacristy are ascribed to Lazzari by CESARIANO, p. 70b.); the façade to the church of S. Maurizio; and the church of S. Ambrogio, all at Milan; the large palazzo Bevilacqua at Bologna; and the painting of the façade of the pal. Latturate, at Milan, which had been the paternal residence of Suardi, are among the works attributed to one or more Bramantino, by VASARI, *Lives*, 8vo., London, 1850, iv, 538-41; iii, 13; and Flor. edit., 1846, xi, 277-82. CESARIANO, p. 48b., states B. Suardi was contemporary with Solaro, B. Zenale, and others. "Bramantino" was engaged 19 May 1519 at Milan cathedral (FRANCHETTI, p. 144). *Le rovine di Roma al principio del secolo xvi*; *Studi del B. S.*; da un manoscritto dell' Ambrosiana; 80 photos, pref. by G. Mongeri, 4to., Milan, 1875, is in the British Museum library. Bra. Suardi with others worked in the "Stanze" at Rome, 1508-9; MUNTZ, *Raphael*, 8vo., 1882, p. 307. 3. 73.

SUASTIKA and SWASTIKA; see SYMBOL.

SUAVA. An error in a work for JUVAVA.

SUAVIUS, Susterman, or Suterman; see LOMBARDO (L.).

SUB ARCH and SUBARCUATION. "William of Wykeham, or his architect, was the first to thoroughly understand and practically apply the principle of subarcuation, that is, the mode of constructing two inferior and subordinate arches under the third or main arch. They both seem to rise naturally from the middle stem, or principal mullion in the centre of the window, diverging at a certain point with an easy sweep or curve, so as to form two independent arches, filled with corresponding tracery, and serving to strengthen, at the same time that they adorn, the master arch that contains them. No better examples can be found than at New College chapel. The principle was known earlier and was practised later, but the arches were often lost in the intersection or crossing of the mullions, sometimes producing the worst possible effect"; INGRAM, in *Memorials of Oxford*, who calls them "subarches"; and *BUILDER Journal*, 1845, iii, 465.

SUBGRUNDA or SUGGRUNDA. A kind of BALCONY. MENIANUM. SALMASIUS in Spartian, *Hist. Aug.*, 8vo., Lug. Bat., 1671, p. 677. SUTONIUS, 4to., Leu., 1714, i, 544.

SUBGRUNDAS; subter. Under the eaves of a roof; SMITH, *Dict. Ant.*, s. v. Agricultura, p. 70a. STILLICIDIUM.

SUB-HALL. The place in the lower story under the hall or chief entrance, which last was usually on the first floor; as in plans 1771; WOOLFE and GANDON, *Vit. Brit.*

SUBIACO (Anc. *Sublaqueum*). A town in Italy, situated near the river Teverone. Old castle on a hill, for centuries the summer residence of the popes. A very handsome church or cathedral dedicated to was built 1788 for pope Pius VI (1774-1800), who was abbot for many years and enlarged his monastic residence. A capital is given in *Illustrations*, pl. 58. At a mile distant may be traced the remains, with a nymphaeum, of the villa of the emperor Nero; the new bridge near is about 240 ft. above the Teverino. Near this is the monastery of Sta. Scolastica, founded v cent., restored 981; the third cloister and refectory 1235, mosaics by Cosmas and his sons (SEBOUX D'AGINCOURT, *Hist. de l'Art, Architecture*, pl. 29, 35, 73, 100); the second cloister has pointed arches

and dates from 1052; the third is more recent. A doorway is given in *Illustrations*, pl. 119. The *Sacro Speco*, the monastery built over the cavern which S. Benedetto converted into his hermitage, *cir.* 450; its lower church perhaps 60 ft. below the church dates from 1053, the cloister from 1253; all being built on nine arches of considerable height; there are several chapels of various dates. *Illustrations*, Pulpit, pl. 50 (or pl. 226), is in the upper church dating from 1066, a specimen of the style prevalent before the time of Jacopo. Both these buildings are now national monuments of Italy. LOMBARD, p. 126. RENIÉ, *Imagerie du Sacro Speco*, XII to XIV cent., 61 pl., fol., Rome, 1855. ULLATHORNE, *Rule of St. Benedict*, 8vo., 1858. WYATT, *The Grotto*, read at ROY. INST. OF BRITISH ARCHITECTS, *Sessional papers*, 1856-7, p. 133; in *BUILDER Journal*, xv, 383; and in *BUILDING NEWS Journal*, iii, 513. 14. 28. 50. 96.

SUBISATI (SEMPRONIO), designed the magnificent mausoleum to king Philip V for his son king Ferdinand VI, by the altar in the collegiate church of S. Ildefonso. Also that of his wife donna Isabel Farnesio; and the casa de oficios of the same monastery. 3. 66.

SUBISSO (PIERO DI), *cir.* 1550 was assisted by Simone, il Mosca, of Settignano, to design certain small works as mentioned in VASARI, edit. 1851, iv, 388.

SUBLEIRAS (GIUSEPPE). A clever pupil of Gir. Teodoli of Rome, *cir.* 1725.

SUBLIMITY. The theory of sublimity has been summed up as follows: "The invariable condition of sublimity in objects, either material or moral, is vastness or intensity. The invariable condition of the emotion of sublimity—that which distinguishes this emotion from every other emotion—is a comprehension of this vastness with a simultaneous feeling of our own comparative insignificance, together with a concomitant sense of present security from any danger which might result from this superior power. The antithesis to the emotion of sublimity is the emotion of contempt"; PENNY CYCLOPEDIA, 1842. BURKE, *Inquiry into the Sublime and Beautiful*, 1757; 1787. HOME, lord KAIMES, *Elements of Criticism*, 8vo., 1840. KNIGHT, *Analytical Inquiry into the principles of Taste*, 8vo., 1805, 2nd edit. STEWART, *Essay on the Sublime*, is entirely philological. BROWN, *Lectures on Philos. of Mind*, lvii. ALISON, *Essays on the Principles of Taste*, 4to., Edinb., 1790. LOUDON, *Country Residences*, 4to., 1806, i, p. 37, 78.

SUBSELLUM. A seat peculiar to heroic personages and to kings; ELMES, *Dict.*, s. v. Seat. THE MISERERE of a stall. It has been applied to the stalls in the choir of a church. 19. 78.

SUBSOIL. It is generally stated that a contractor has a right to all minerals and materials he may come across in excavating for the proposed works; as sand, which may from its locality be very valuable. The owner's interest may be guarded by calling attention in the specification to the nature of the subsoil to be removed and upon which tenders are to be received, or otherwise providing for its value. The removal of subsoil from roadways and filling in the excavations with rubbish have caused settlements injuring drains and pipes, the surface of the roadway; and the walls of the houses adjoining are rendered unstable by building on "filling in" after removal of subsoil. SLACKE, *Notes on Subsoil drainage, foundations, etc.*, fol., Chatham, 1878.

A combined subsoil and main sewer pipe was patented about 1879 by E. Brooke of Huddersfield, which may be useful in soft soils, as the two are laid in one operation. It is manufactured up to 24 in. diam. for the main pipe.

SUBSTRUCTURE. An underpinning, groundselling, etc. Also foundation or footings. 4.

SUBTEGULANEUM; OPUS. A pavement; the same as BARBARICUM.

SUBTERRANEAN. Something formed underground, as follows:—

CHAPEL OR CRYPT (*It. confessione*). Examples at Assisi; Syracuse, chapel of S. John; Provins; Rosnay; S. Odile, Bas Rhin, ARCH. PUB. SOC.

in chapelle de la Croix; Paris, S. Chapelle; Bâle; Glasgow; S. Miniato; Rome, S. Pierre in Montorio. ASHPITEL, *Use of Crypts, etc.*, read at Royal Institute of British Architects, *Sessional Papers*, 1859-60, p. 138. CONFESSION. CRYPT. HYPOGAEUM.

CHURCH. At Monte Casino (CUCCINIELLO AND BIANCHI, *Viaggio pittorico—due Sicilie*, fol., i); S. Sisto in Bari (ii, 97); Palermo (iii, 39); Otranto (ii, 109); Messina (iii, 107); and Mola di Gaeta (i, 99).

CHAMBER (Pers. SERDAUB; Scot. ERDE HOUSE). Nitocris ordered one to be built for a festival, and having invited those Egyptians whom she knew were concerned in her brother's death, by a concealed canal let the river amongst them; HERODOTUS. A chamber or church, 27 ft. long by 7 ft. wide and high, about 15 ft. north of the Presbytery of Ferrières-Haut-Clocher, near Conches, dep. Eure, and 60 ft. from the apse of the church: supposed for secret worship, as at the monastery at Jumièges, very long; at the abbey of Fontenelle or S. Wandrille, near Caudebec en Caux; at Torp, a dependency of Jumièges, in the forest of Brothorne; *BUILDING NEWS Journal*, 1861, vii, 655. Three chambers at New Quay, northern extremity of the ancient Burren, the district of O'Loughlin, in county Clare, Ireland; KILKENNY ARCH. SOCIETY, *Transactions*, 1849-53, i, 294. CELTIC BUILDINGS. NEW GRANGE. CAIRN. KISTVAEN. CATACOMB. *La Campania sotterranea*, in FOREIGN QUARTERLY REVIEW for 1836. The Mithraic mysteries were generally performed during the lower ages in caverns. STUART, *Athens*, fol., 1830, iv, 28; s. v. Delos; (MITHRAEUM).

PASSAGE. KLIMI, *Iter subterraneum*, Hafniae, 1741. The story of Bel and the Dragon contains the description of a pagan temple in Babylon, 600 B.C., which corresponds with those of later date examined by sir C. Warren in the Lebanon and about Hermon, especially regarding the secret entrance for the priests. The *adytum* of the Greeks had sometimes an underground passage like that of Neptune in the Isthmus of Corinth mentioned by PAUSANIAS, especially so where the oracles were given. One mentioned by him was discovered at the foot of the acropolis at Argos (ADYTUM. HIERON. CELLA). At a temple at Alba Fucentis; and at that of Isis at Pompeii. The so-called subterranean passages found in sites of religious houses, now generally supposed to lead to some neighbouring church or castle, may have been used as PENITENTIAL CELLS. One, 5 ft. diam., under the cloister area of the Cluniac priory of S. Pancras, at Lewes; as explained s. v. Lantern. Wanswell court, Woccestershire, to Berkeley castle; supposed Turton tower, Lancashire, to Bradshaw hall, and Bolton; Beeston castle, Cheshire, near bottom of a well, to ...; Guildford, and dungeons. Escorial in Spain; the *mina* or tunnel between it and the offices is 181 ft. long, 10 ft. high, and 7 ft. wide, dates 1744-74, by Pontones. At Rye house, Hoddesdon, Herts; *BUILDER Journal*, 1858, xvi, 596. Eltham, at bottom of a shaft; NOTES AND QUERIES, 1878.

PICTURE GALLERY. At Welbeck abbey, for duke of Portland.

TEMPLE with marble columns, etc., at Lenno, in Lombardy (50). See ROCK CUT; in India; on the western side of which there are an infinite number of rock-cut temples, but no tombs of any sort.

TOMB. With scarcely an exception, all the excavations in Egypt proper are tombs, and no important example of a rock-cut temple has yet been found; while in Nubia, all the excavations are temples, and no tombs of importance are to be found anywhere. MYCENÆ. ORCHOMENOS.

SURVEYING. FENWICK, *Subterraneous Surveying, and the Variation of the Magnetic Needle, etc.*, 2nd edit., 8vo., Durham, 1822.

SUBWAY. A tunnel to contain the sewerage, waterage, gas-pipes, electro wires, and other appliances for public benefit. William Austin projected such a work, a section of which is given in CIVIL ENGINEER, etc., *Journal*, 1854, xvii, 383. Projected bill, *BUILDING NEWS Journal*, 1865, xii, 418. L'égout galerie du boulevard Sébastopol, at Paris; NOUVELLES ANNALES DE CONSTRUCTION, fol., 1856, pl. 55. Approach to Covent Garden;

CIVIL ENGINEER, ETC., *Journal*, 1860, xxiv, 130; *BUILDER Journal*, 1860, xviii, 640. Thames Subway; proposed; *BUILDING NEWS Journal*, 1867, xiv, 828. At Nottingham; two previous to 1866, then another in centre of town. Under Charing cross road, 1887; 12 ft. wide by 7 ft. 9 in. high formed of a semicircular brick arch; a sewer is built under the centre of the subway. A tunnel is being made 1887 by the city of London and Southwark subway company, from the north side of the Thames to near the Elephant and Castle; and it is now proposed to be extended to Stockwell. WOODWARD, in "Westgarth Prize Essays", 1886, p. 75, suggests that it should be made compulsory that in every new street formation, a subway be built for the reception of pipes, etc., and wires; p. 136 gives a section of such subway; and p. 93, reference is made to those already constructed in London, and the absence of one, in Gray's inn road. Also by him in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, ii, and *Proceedings*, Nov. 19, 1885; and SURVEYORS' INSTITUTION, *Transactions*, 1885-6, xviii, pt. 7, gives plans and sections. At present the gas and water companies decline to use the subway. Explosions thereon; *ENGINEERING Journal*, 1868, vi, 135. The first idea of a subway appears in PATTE, *Mémoires*, 4to., Paris, 1769, p. 34 and 70, pl. 2. TUNNEL.

SUCCATORI (GIOVANNI), designed the church of the Camaldolesi at Bielany, near Cracow; CIAMPI, *Viaggio*, p. 150. GRABORSKI, *Guide to Cracow*.

SUCCOTH; see SUKKOT.

SUDATIO or SUDATORIUM; the "concamerata sudatio" of VITRUVIUS, v. 11. The vaulted sweating-room of the Roman baths, formed in length double the width. The LACONICUM or hot bath was connected with it at one end. ARCHICOLUM. ARCHITHOLUS. The plan in one house at Pompeii resembles the FRIGIDARIUM of the thermae, being a circular room with four niches serving as seats, formed out in the wall; it had a hollow floor and hollow walls for the heat to pass; SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE, *Pompeii*, 8vo., London, 1831, i, 157, 167, 185, 190; ii, 216. 78.

SUFETULA. Now represented by Sbeitla, in Tunis. Gregorius, governor of Africa, selected it as his capital; its wealth became a prey to the Arab invasion. The ruins are the most valuable of all the monumental remains discovered in Tunisia, offering admirable examples of Roman architecture before its final decline. The principal ruin is a walled enclosure or hieron, 238 ft. by 198 ft. (*Sessional Papers*, 1876-7, p. 36-7; and 1885-6, p. 180). Facing the gateway were three temples, side by side, the back walls being joined by open arches; the centre temple was of the Composite, as the others were of the Corinthian, order, all standing on lofty stylobates. The gateway, dedicated to Antoninus Pius, consists of a large central arch and two side ones. A massive triumphal arch to the south of the city was erected by Maximian; there are also very many fragments. Over the river Sbeitla is a modern bridge and aqueduct of four arches. These ruins are now under the care of the COMMISSION DES MONUMENTS HISTORIQUES of France; GRAHAM, *Roman Occupation*, etc., in Royal Institute of British Architects, *Transactions*, 1885-6, p. 179-181, pl. 43-50.

SUFFITIUS, Sufficus; Sufficus in Brit. Museum, Harl. MS. 2508; see FUFICIUS or Fufidius.

SUFFLOT; see SOUFFLOT (J. G.).

SUFFOLK BRICK, also called Ipswich and white Suffolk brick; and made at Woolpit, near Stow, in Suffolk; white and red Suffolk facing brick, etc., at Ballingdon, near Sudbury. They are made also from the Gault clay. They contain a large proportion of sand; are rather soft for ordinary building purposes, but harden in time, which is attributed to the silicic acid in the clay acting upon the chalk so as to form some of it into a silicate of lime. Suffolk bricks are of two or more qualities expressly made for facings; the best are usually sold for use in the locality of manufacture. They have a regular stone-coloured hue, considered cold and disagreeable by some, and rendered more so after a few years' wear in a smoky atmosphere: they

are not so well burnt as those which are somewhat of a light pink or salmon tint. 1.

SUFFOLK LATCH; see LATCH.

SUFFULCRUM. The Latin term for a supporter or stay. A term guessed at in the passage "one pair of suff" bought to mend the work of the finials of the tabernacles, 5d." BRAYLEY AND BRITTON, *Palace of Westminster*, 8vo., 1836, p. 165. 19.

SUGAR. A paper on the corrosive action of sugar on metals, was read by Dr. J. H. GLADSTONE before the BRITISH ASSOCIATION in 1853, as stated in *ATHENÆUM Journal* for that year, p. 1134; and another by him at the CHEMICAL SOCIETY, 1 May 1854. Iron became corroded about the edge of liquid pure cane sugar, but when immersed it remained bright. The solution was found to contain protoxide of iron, and was of a deep red brown colour. Copper was scarcely acted upon; lead was more easily attacked especially at a high temperature; zinc and tin were very slowly and but slightly affected, the former more quickly when in contact with iron; mercury and silver escaped injury. The use of sugar in mortar and cement, on account of its present cheapness and quality of hardening, was advocated in the *Times Newspaper* for 13, 16, October 1886. Jaggery, JAGGREE, goor, cocos, or unrefined sugar in India. CHUNAM.

SUGAR HOUSE or REFINERY (Ger. *Zuckerfabrik*) at Neukenersdorf, by Jäkel (ALLGEMEINE BAUZEITUNG, 1853, pl. 580-96, etc.). URE, *Dictionary*, 8vo., 1853.

SUGER or Suggest; born 1081 was abbot 1122-51, of S. Denis, near Paris, and died 1151. In 1128 he is said to have restored the monastery of Argenteuil to his abbey; rebuilt his abbey on the crypt of 662; of which the anterior part was dedicated 1140, and 1143 the head part. This edifice has been claimed as the first example of the Gothic period, and the abbot as the inventor. PARKER states that those parts of the church which are of the time of Suger (1140-5) are not Gothic, in *ARCHÆOLOGIA*, 1869, xliii, pt. 1, p. 73. Odo or Eudes Clement succeeded him. FELIBIEN, *Histoire de S. Denis*, fol., Paris, 1706, p. 237, 253, 528, App. cciv. LENOIR, *Arch. Monastique*, 4to., Paris, 1852-6; i, 89; ii, 85, 90, 270, 386. WHITTINGTON, *Historical Survey*, 8vo., 1811, p. 128-134. DALY, *Revue Générale*, i-vi. FERGUSSON praises his capabilities as commencing the abbey 1140-44 in the new style; and who considers the west front and the choir remain in all essentials as left by him; *History*, 1865, i, 473-4; 505.

SUGGESTUS. Any elevated platform; the covered seat in the amphitheatre appropriated to the emperor; also called "cubiculum". A stage or pulpit. A cantilevered balcony as used by SERLIO, *Architettura*, fol., Ven., 1663, p. 79, with podium, menianum and concio, It. *poggiuolo*, *pergola*, and *ringhiera*,—all for the same. 78.

SUGGRUNDARIUM. Roman children who had not cut their teeth, were not burnt, but buried in a place so called. PLINY, *H. N.*, vii, 15. 78.

SUILLAGE. "We should first of all digge wels and cesterne and other under conductes and conueiances, for the suillage of the house"; WOTTON, *Elements of Arch.*, 8vo., 1624, p. 24. SEWAGE.

SUTNAGA (MARTIN DE), completed 1715-9 the other half of the façade of the royal monastery of S. Marcos at Leon; the first portion with the portal was done 1537-43 under J. de Badajos. 66.

SUKKOT or SUCCOTH. A place in Nubia. HOSKINS, *Ethiopia*, 4to., 1835, p. 253-5. The mound of Tell el Maskhutah is Pa-tum, or Pithom, or Sukkot, founded by Ramses II and his son Men-ptah, the pharaoh of the Exodus. Some ruins exist. EGYPTIAN EXPLORATION SOCIETY, *Proceedings*, 1886.

SULCHAD or Sulkhad; see SALCAH, in Bashan.

SULEIMANIEH and Suleiman. The ancient Clanudda, situated near Kobek, in Asia Minor, on the top of an immense precipitous mountain. There are the ruins of the seats and proscenium of a theatre about 90 ft. wide; wall of the acropolis; a doorway; a portico; an arch; a large gateway of yellow stone; a temple of white marble, and two others; three arches

about 15 ft. wide and 10 ft. high; a temple to emperor Claudius (41-54) of immense blocks; four square Doric columns (out of 16) of yellow stone and many other columns. A rough plan and view are given in ARUNDEL, *Asia Minor*, 8vo., 1834, i, 80-88.

SULLIAGE; see SEWAGE. SULLIAGE.

SULLING or solin; see SOLANDA; and HIDE.

SULMO. A city of Latium; represented by Sermoneta. 23.

SULMO. A city of the Peligni, now represented by Sulmona, in the province of Abruzzo Ultra II, in Naples. The see of a bishop since the fall of Valva which had arisen on the ruins of Corfinium. It is walled and well fortified; has a superb cathedral, 15 other churches, 11 monastic establishments, and a town hall which is a remarkable specimen of cinque cento architecture. The ruins comprise an amphitheatre, theatre, thermæ, all outside the gates of the modern city. At the foot of the monte Morrone are some ruins of reticulated masonry perhaps of a Roman villa. ROMANELLI, *Napoli Antica*, etc., 12mo., Nap. 1815, iii, 159-61. CRAVEN, *Abruzzi*, etc., 8vo., 1838, ii, 22. It was a considerable town B.C. 49. 14. 23. 50.

SULPHATE OF COPPER; Roman or blue vitriol. A metallic salt, a compound of copper and sulphuric acid. It forms Margary's, and Boucherie's processes for the preservation of timber, and of others. DALY, *Revue Gén.*, 1845, vi, 24.

SULPHATE OF IRON; or copperas or green vitriol. A metallic salt, a compound of iron and sulphuric acid. This 1837 was proposed by ... Bréant for the preservation of timber as it did not alter the qualities of wood like Kyan's bichloride of mercury. In the experiments at Welbeck, in the mushroom house, copperas with lime water applied to Scotch fir deals resisted decay longer than any other material tested; ARCHITECT *Journal*, 1850, ii, 190. PAYNE'S process.

SULPHATE OF LEAD. An exceedingly white precipitate from any solution of lead by sulphuric acid. It has most of the properties of the best white lead but is rather inferior in body and permanence.

SULPHATE OF LIME; see ALABASTER. GYPSUM. SELE-NITE.

SULPHATE OF ZINC or white vitriol. A metallic salt, a compound of zinc and sulphur. As a deodoriser it possesses all the properties of sir W. Burnett's disinfecting fluid. In contact with decomposing animal matter the acid takes the ammoniacal emanations, while the zinc precipitates the sulphuretted hydrogen, carburetted hydrogen, etc. It is concentrated in the highest possible degree, and in use should be mixed with from ten to fifty times its bulk in water. In warm climates where the drainage of hastily built cities has not been attended to it would counteract the baneful effects of the exposure of feculent matter. Sulphate of zinc may be crystallised, and can be obtained in a shape admitting of safe and easy carriage.

SULPHUR, commonly called brimstone. A simple combustible substance. A solid non-metallic body, met with pure and in various states of combination, as with numerous metals and in immense quantity, as with iron, copper, lead, etc., constituting the principal ores of these metals. Also largely with oxygen forming sulphuric acid, which is generally united with an earthy base, as with lime, constituting sulphate of lime or gypsum, etc. It is found in beds and veins, as in Suabia in veins traversing granite; in mica slate near Schemnitz in Hungary; and at Bex in Switzerland in limestone and gypsum of the salt deposit. The most remarkable deposit of volcanic sulphur is that of Solfatara near Naples, from whence it is largely imported; also in fissures of lava near the craters of volcanoes, in Italy, Guadalupe, Nevis, and the volcanoes of the Cordilleras. It is chiefly supplied from Sicily. PARODI, *Sull' estrazione dello zolfo in Sicilia e degli usi industriali del medesimo*, 8vo., Fir., 1873. LA BRETOIGNE ET RECHTER, *Industrie Soufrière de Sicile*, 8vo. 14.

The fuel employed in the furnaces of iron works, or in second runnings, should be deprived of its sulphur, for the iron has a remarkable affinity for that substance in any of its forms, and is rendered exceedingly brittle by its introduction. Sulphur in

coal gas acts upon the ingredients of which glass chimneys are composed, and dims the light; oil lamps have the same effect but not so speedily; INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1843, ii, 189.

The method of fixing iron into stone at a paper mill at Friburg in Germany was thus done; the hole is made larger than usual; then so much of the bar as enters the stone is tapered, being largest at bottom, and if square the angles to be jagged; round it is placed irregular bits of iron such as might be cut from old nails, etc.; the hole is then filled with melted brimstone, and when cold the bar will be found firmly fixed. D. Crabb, in SOCIETY OF ARTS, *Transactions*, 8vo., 1845, lvi, 11. It is, however, considered in England, that with moisture a chemical action is set up between the iron and the sulphur, and at the end of a few years the sulphur has united with the iron and moisture, forming a true hydrated sulphide of iron. During the formation of this compound, the whole mass swells greatly, and either the compound is forced upwards out of the hole, or the stone itself gives way; granite even does not withstand the action; perhaps 15 to 20 years elapse before the stone actually breaks. —The iron itself is frequently corroded within the stone to the extent of half its diameter; GATEHOUSE, in *BUILDER Journal*, xxxiv, 1876, p. 862. A similar result of cramps in sulphur occurred 1875 at Bridgewater house, London. The "running in" or "studding" iron railings into stone, is noticed *BUILDING News Journal*, 1878, xxxv, 358. JANOTER, *Influence of S. upon Cast Iron*, CIVIL ENGINEER, ETC., *Journal*, 1853, xvi, 46. OXIDATION (p. 62). STONE (p. 141).

SULPHURIC ACID is made in large leaden chambers. The sulphur from New Zealand is very pure, containing 95 per cent. sulphur, a very slight trace of selenium, and no arsenic; the acid made by some manufacturers being made by pyrites, contains arsenic. The specific gravity is 1.750 to 1.800. Sulphuric acid forms part of gypsum or sulphate of lime. The extraordinary effects of sulphuric acid on the walls of a channel "built in lime bond with quarry stones (gneiss)", after a few years, at the Mulden vitriol works, near Freiberg, is shown in *BUILDING News Journal*, 1869, xvii, 201, from HERING in the *FREIBERGER JAHRBUCH*, 1869, p. 137. H. A. SMITH, *Chemistry of S. A. manuf.*, 8vo., 1873. Sulphuric acid placed in an earthen vase and put in a damp room will soon absorb vapour; DICKSON, in *CIVIL ENGINEER, ETC., Journal*, 1849, xii, 30.

SULTANIEH, Sulthanyeh, or Sultaniyah. In the province of Irak-Adjemi, on the river Zengan, in Persia; was founded by Mahommed Khoda Benda. His beautiful mosque and tomb, 1303-16; ruins of a palace; and general view, in FLANDIN ET COSTE, *Perse Moderne*, fol., Paris, 1844, pl. 11-2; plan, etc., with coloured details, in TEXIER, *Arménie*, fol., Paris, 1842-52, ii, pl. 54-8, who gives the wrong date of 1577-85; and tomb of mollah Hassan, pl. 53. The dome, a pointed arch in section externally and internally, is 81 ft. diameter and 150 ft. high; on the outside is an arcade round the base of it; also in FERGUSON, *Handbook*, 1855, i, 404-5. The summer palace of the shah, who here avoids the heat of Teheran, is mean and ill-built; KEPPEL, *India to England*, 8vo., 1827, ii, 155. CHARDIN, *Voyages en Perse*, par Langlès, 8vo., Paris, 1811, ii, 376, pl. xii. CORN. LE BRUN, *Voyage par la Moscovie*, fol., Amst., 1718, p. 176. 50.

SULZDORF (HANS OF); see HANS (fourth).

SUMACH; of the genus *Rhus*. *R. vernicifera*, the varnish-bearing Sumach, or Japan varnish-tree, is a native of Japan and Nepal. The two or three-year-old branches are cut and the varnish oozes out, at first white and of the consistence of cream, but blackens and thickens on exposure. As it is very transparent, the natives varnish all the woodwork of houses and furniture. The *Rhus copallina*, Gum Copal or mastick-leaved *Rhus*, a native of North America, is supposed to yield the gum copal of commerce from which copal VARNISH is made. Many other varieties are grown in England in the open air or in hot-houses. 14.

SUMMER. "A beam"; HORMANUS, *Vulgaria*, 1519, p. 241. "All the som's or dormants", 1505, GAGE, *History of Suffolk*, i, 140. A large beam lying across a house, each end of which lies upon a wall, and into which girders are "tenanted" or tenoned (1694). A lintel supported on two stout posts. A binding joist extending from the wall into the side of a girder. BRESSUMER. DORMAN TREE. SOMER. 4. 19.

A name given to the first stone laid over a column or pier, whether an arch stone or lintel, but usually the former. Summering or springer was the name formerly applied to the radiating beds of a stone arch (Fr. *sommier*, VIOLET-LE-DUC, *Dict. Rais.*, s. v.; and s. v. Construction, p. 91-126. 1. 4.

SUMMER or SOMER STONE. The lowest stone at the end of a gable stopping the eaves of the tiling or slating. The first piece of the *tabling* is worked in the solid of the summer stone, and so becomes an abutment and support for the rest. It is also called a SKEW CORBEL or table; SPUR, and KNEE. 1.

SUMMER HOUSE (Lat. SOLARIUM). A rustic structure, for recreation and enjoyment of air, made of any form and material that may harmonise with the surrounding scenery. It should be closed on three sides, if open in front, and this should face the south-west as near as may be, and be entered by a flight of two or more steps. "A temple" often formed the end of a long walk; or was found secluded in a shrubbery, erected on the summit of a hill, or on a mound, and from which a view could be obtained. The adjoining plantations should be chiefly evergreens, so as to be enjoyable in winter also. The background may be varied with deciduous trees. PAPWORTH, *Ornamental Gardening*, 8vo., London, 1823. HOFLAND, *White Knights*, fol., London (1819). RIMMER, *Ancient Halls, etc.*, 4to., 1852, gives a seat from Peel hall, Lancashire. A curious solarium at Lambeth palace, s. v. Park and Gardens, designed by Dr. John Ponet or Poynt, afterwards bishop of Rochester and of Winchester 1550-53, was removed some time before 1803; STORER and GREIG, *Select Views of London*, 4to., London, 1804.

SUMMIT. The heights of the summits of public Buildings in France, and of the principal Towns, are given in BUILDER *Journal*, 1862, xx, 294-5.

SUMMIT STONE; see HIGH MOOR STONE.

SUMP and **sumph.** In mining, is a large pit sunk in the engine-shaft below the lowest workings. A chamber or reservoir from which water or other liquid has to be raised. A pit in the course of a water-supply trough or pipe into which any dirt, etc., can fall, and be cleaned out. Aqueduct, *Detached Essay*. Sumps or wells at the mouth of sewers; a scheme proposed by Fowler and Prestwich in 1849, in the first series of plans for the drainage of the metropolis; ARCHITECT *Journal*, 1849, i, 436.

SUN; **TEMPLE TO SOL.** **HELIEIUM**, a temple or place sacred to the sun. The most celebrated temple was that at PALMYRA; IRBY and MANGLES, *Travels*, 8vo., 1823, p. 269; who p. 317, mention another large one at Djerash, Roman Pella or GERASA, and as fine; and having under the principal hall, a chamber with a bath in the middle. Another temple at BAALBEC or Heliopolis. At Rome, the architrave and cornice of an immense temple attributed to the time of Aurelian A.D. 274, or Hadrian, still remains in the Colonna gardens, on the former Quirinal hill; it was formerly called "frontispiece of Nero", and was measured by PALLADIO, *Architettura*, fol., Ven., 1570; also DESGODETZ, *Edifices Antiques de Rome*, fol., Paris, 1682; 1695, chap. xiii. The largest stone is estimated to weigh 100 tons, by REIBER, *Ruinen Roms*, Leip., 1863, p. 497. It is now considered of the time of Marcus Aurelius and Commodus (161-180); and to have been dedicated to Sol and Serapis, also called "the Serapeum"; GROTER, p. lxxxv; PARKER, *Walls of Rome*, 8vo., 1874, i, 90. BRAUN, *Ruins*, 8vo., Bruns., 1854, p. 21. At On, Egypt, called Heliopolis by the Romans, now represented by the village of Matariyeh, near Cairo. At Emessa, the Sun was worshipped under the name of Elagabalus, and under the form of a black conical stone, or aërolite, which had fallen there. At Hieropolis, in Syria, no statues of the sun and moon were allowed to be made; GIBBON,

Decline, etc., edit. 1853, i, 184-5, chap. vi. At Terni, remains in circular church of S. Salvador, called of a temple (28). At Troy; SCHLIEHMANN, *Troy and its remains*, 8vo., London, 1875, p. 146, 183, 223. At Cusco, in Peru, entrance on north-east side; SQUIER, *Peru*, 8vo., 1877. At Sippara—the Chaldean Heliopolis—the terra-cotta cylinders recording the deluge in the time of Xisuthrus, tenth king of Chaldea, as discovered by Rassam; TIMES *Newspaper*, Aug. or Sept. 1881. At Rhodes, the temple to Sol, was the finest of the number in that city. 1.

SUN BLIND. A contrivance to a window or door to keep off the hot rays of the sun; such as the Venetian blind; the French *jalousie*; the helioscene invented 1865.

SUNDAY SCHOOL; see SCHOOL.

SUNDEN (BERNARD VON), said to have been a pupil of Erwin von Steinbach who died 1318, and to have married his daughter Sabina. A great part of the church at Magdeburg is attributed to him, but probably only the vaulting can be due to him.

SUNDIAL. The science of constructing sundials was formerly known as Gnomonics. A sundial still remains nearly in its original position on the rock of the Acropolis at Athens; it appears to be of the same sort as the hemispherium invented by Aristarchus of Samos. Several dials remain at Athens, as at the Tower of the Winds, given in STUART, *Athens*: a bas-relief of one is given in PACIUTI, *Monumenta Peloponnesia*, i, 68. VITRUVIUS, ix, c. 9. WINCKELMANN, *Mon. Ined.*, No. 151. MILLIN, *Gal. Myth.*, pl. 171. BLUNDELL, *Statues, etc.*, in *Ince Collection*, 8vo., 1803; or fol., 1809, pl. 71, gives a spherical Greek dial; another is at lord Besborough's at Roehampton; one from Asia Minor is in the British museum; and the dial of Phædrus, now in the Elgin room in the British museum, and in *Elgin Marbles*, ii, p. 111; also described by DELAMBRE; others in the forum at Rome, set up A.U.C. 491 and 590. MARQUARDT, *Leben der Römer*, 8vo., Leip., 1879-82, who refers to the above, to thirteen found near Rome, two in Herculaneum, twelve in Pompeii, etc. The widespread use of dials, which are not wanting even in villages, makes it clear that in the empire the course of private life was regulated by the hours of the day and the dial was a necessity. MONTUELA, i, p. 720-3. VISCONTI, *Mémoires*, p. 78.

A Saxon sundial over south door in Kirkdale church, Yorkshire, is shown in ASSOCIATED SOCIETIES, *Reports and Papers*, 1877, p. 208-10, with others at Edstone, at Locking or Lockton, and at Old Byland, at Aldborough in Holderness, all divided into eight-hour lines instead of twelve, perhaps for the hour of prayer, PHILLIPS, *Rivers, etc.*, of *Yorkshire*, 8vo., London, 1853, p. 87: 2nd edit., 1855. A column with 60 sundials, at Caius College, Cambridge, 1576, was inscribed "Theodorus Haveus Clevisensis, artifex egredius et insignis architectura professor fecit"; it was taken down before 1780; VETUSTA MONUMENTA, fol., ii, 15. A pedestal having seven dials dated 1578, on the garden terrace at Park hall, near Oswestry, is given in ARCHEOLOGICAL INSTITUTE *Journal*, 1856, xiii, 417. John Mylne, mason, carved the queen Mary's sundial in the garden at Holyrood palace, for king Charles I; it cost £408 15s. 6d. Scots. The figure of a moor supporting a sundial was presented to Clement's Inn, London, by Holles, lord Clare, who brought it from Italy: it was sold in 1884, and is now placed in the Inner Temple Garden. 14. 78.

One of the earliest works on the subject is FALE, *Art of Dialling*, 4to., London, 1593; 1626; with about twenty others are named s. v. Horologe, Dial and Sun Dial, in WATTS, *Biblio. Brit.*, 4to., Glasgow, 1819-24, ranging down to 1775 and 1793. GUNTER, *Descr. of the Dials in Whitehall Gardens*, 4to., 1624. F. HALL, *Explication of the Dial in the King's Garden at London*, 4to., Liege, 1673. GOOD, *Art of Shadows, or Universal Dialling, etc.*, 12mo., 1721. GATTY, *The Book of Sundials*, 4to., 1872. PROCTER, *Dict. of Arts and Sciences*, gives simple directions. BREWSTER, *Fergusson's Lectures*, describes the various kinds. Mottoes for Sun dials, in Lincoln's Inn, BUILDER *Journal*, 1862, xx, 294.

SUN-DRIED BRICK or Crude brick (Sp. *Adobe*). The soil

of ancient Assyria and Babylonia consists of a fine clay mixed with sand, with which, as the waters of the river retire, the shores are covered. This compost, when dried by the heat of the sun becomes a hard and solid mass, and forms the finest material for the beautiful bricks for which Babylon was so celebrated. Taking some of this mud while wet from the bank, and molding it into form, then exposing to the sun for half an hour, it became as hard as stone; KEPPEL, *Narrative*, 8vo., London, 1827, i, 115. BRICK, HISTORY OF (p. 136), for Egypt and other countries. Numerous specimens are in the British museum. The ruins of Casas Grandes, south of New Mexico, the adobe differs from that now made by the Mexicans, in that the blocks are very much larger, being 14 ins. or 16 ins. by 12 ins. by 3 or 4 ins. Gravel was mixed with them which greatly increased their hardness, but no straw was used; ALL THE YEAR ROUND *Journal*, 1869, p. 544. The Persian sun-dried bricks of modern times are made of tempered earth and finely chopped straw, in moulds about 8 ins. by 6 by 2½. SIMPSON, *Mud Architecture*, read at ROYAL INST. OF BRIT. ARCHTS., *Proceedings*, 1887, p. 149, etc. MUD. COB WALL. WATTLE AND DAB. PISÉ. CLAY WALL. RAD AND DAB. DAUBING. FORMACEUM or FORMARIUM OPUS.

SUNERE (HEINRICH); see SOYNER (H.).

SUNIUM. A promontory and demus on the southern coast of Attica; it was fortified B.C. 413 and considered as one of its principal fortresses. The walls have square towers of regular Hellenic masonry. The ruins of the temple to Athena (attributed by some authors to Ictinus, temp. Pericles), crowns the summit of the promontory. A plan is given s. v. Humerus, as used by VITRUVIUS, iv, 7. It is of the Doric order, hexastyle, each column, about 3 ft. 4 ins. diam., having sixteen elliptic flutings; nine columns on the south and three on the north side remain with the architrave, and two more with one of the ante of the pronaos with architrave. The marble, from the neighbouring mountains, has much decayed. This temple is said (July 1875) to have been cleared of the rubbish surrounding it. Foundations of the propyleum, with Doric columns 2 ft. 10 ins. diam. WORDSWORTH, *Athens and Attica*, 3rd edit., 8vo., 1855, p. 207, notes that extensive vestiges near these ruins may perhaps indicate the temple of Poseidon. LEAKE, *The Demi of Attica*, 1840; 2nd edit., 18 , p. 63. BLOUET, *Morée*, fol., Paris, 1834-6, iii, pl. 30-5; SOCIETY OF DILETTANTI, *Ionian Antiquities*, fol., 1797, ii, pl. 9-14; and UNEDITED ANTIQUITIES, fol., 1817, ch. 8. In the print room of the British museum are eight drawings by Lusieri and S. Ittar and the artists employed by lord Elgin; STUART, *Athens*, fol., edit. 1830, iv, 28, s. v. Mycenæ.

SUNK SHELF. A shelf of a dresser in a kitchen, which has a sort of groove sunk near the edge, into which the edge of the plate or dish enters and so prevents its sliding off.

SUNK SQUARE. A panel with quatrefoils or trefoils, enclosing a rose of eight leaves.

SUNK WORK; see ENTAIL.

SUNLIGHT or SUNBURNERS. A congregation of lights placed at the ceiling. The idea of lighting the stage of a theatre exclusively from above was suggested by G. Godwin in 1847, on the basis of experiments successfully made some years before in a provincial theatre in Scotland; BUILDER *Journal*, 1847, v, 281; ix, 406; xvi, 608. About 1858 was invented the cluster (about 20 to 100) of gas burners placed under a concave reflector from 2 to 4 ft. diameter, at or near the level of the ceiling of a large room, to give a diffused light, and to afford a means of forced ventilation by an outer tube, at the same time that the products of combustion are carried off by an inner tube. Many accidents to the floors and roofs of buildings were at first caused, from want of sufficient protection from the great heat; as related in BUILDING NEWS *Journal*, 1869, xvi, p. 351; and ARCHITECT *Journal*, Dec. 1874. Messrs. Strode and son 1862 invented a "mercurial regulator" for the prevention of draught in the flue when not in use, being one cause for the removal of the lights. Another invention by T. C. Sorby, by mica flaps in the

ARCH. PUB. SOC.

tube, is described in BUILDING NEWS *Journal*, 1871, xx, 210; 140; 178. Billing and Co. invented a self-acting valve and wind-guard. One patent (Rigby and son 1870 ?) fixed and ventilated them by earthenware boxes, pipes, bends, etc., thus reducing the temperature of the air from the lights to about 120°, it being about 400° in the sheet-iron pipes, etc., often used.

SUPER ALTAR. The consecrated altar-stone, frequently composed of precious marbles edged with silver; PUGIN, *Glossary*, 4to., 1846, p. 219, describes several. DUCANGE, explains the term by CIBORIUM or a portable altar. A small stone consecrated by a bishop, which is carried by the Roman catholic clergy instead of an altar when mass is said in houses; OWEN AND BLAKEWAY, *Shrewsbury*, 4to., 1825, ii, 209, quoting FOX, p. 1446. BINGHAM, *Origines*, ii, 445. *History of Christian Altars*, by the Ecclesiological Society, 8vo., 2nd edit., 1847, p. 15. GUENEAULT, *Dict. Icon. des Mons.*, 8vo., 1845, s. v. Autel. 19.

In the stiftskirche at Stuttgart, 1419-31 is a stone one of twelve small niches with figures. In Ulm cathedral is a range of chapels north and distinct from the choir; in one is a carved super altar, 1491, having ten figures. In Como cathedral is a painting of the death of S. Jerome; WEBB, *Continental Eccles.*, 8vo., 1848, p. 156, 166, 195.

A shelf or ledge let into the east wall just over the communion table, on which are placed the cross, lights, and flower vases, not allowed by the English law on the table itself. 1.

SUPERCILIUM, Superlimitare, et sublimen hyperthyri. The lintel or horizontal architrave to a door; VITRUVIUS, iv, 6. It is also described, incorrectly, as the top member of a cornice, also called corona, crown, and larmier; and also the square member under the upper torus in some pedestals. FILLET. LIST.

Supercilium or lynch; a terrace formed in hill-sides by continually ploughing in one direction to render land more fit for farming.

R. R. R.

SUPERFICIAL AREA of a building. Calculations have been made by WHEWELL, *German Churches*, 8vo., 1842, 3rd edit., p. 225; and by GWILT, *Encyc. of Arch.*, 8vo., 1876, p. 407; including points of SUPPORT. *Dimensions of British Churches*, in BUILDING NEWS *Journal*, 1867, xiv, 646.

SUPERINTENDENT. See ARCHITECT, INGENIATOR, SUPERVISOR, SURVEYOR, surveyor general, OVERSEER, MASTER OF THE CRAFT, MASTER OF THE FABRIC, MASTER OF THE WORK, KEEPER, DIRECTOR OF THE WORKS, CLERK OF THE WORKS, labourer in trust, clerk of the cheque, DEVISOR, MASTER MASON, ORDINATOR, INTENDANT, PROVIDOR or purveyor, comptroller and controller, WARDEN, CUSTOS, county surveyor, town surveyor, DISTRICT SURVEYOR, inspector, foreman. PAPWORTH, *Superintendents of English Buildings in the middle ages*, read at Royal Institute of British Architects, 23 Jan. 1860, and 2 Dec. 1861. HUNT, *Tudor Architecture*, 4to., 1830, p. 21-4-5.

SUPERLIMINARE. The frieze between the architrave and cornice of the dressings to a doorway; as in PLINY, H. N., xxix, 4, evidently the same as HYPERHYTRUM. LIMEN.

SUPERSTRUCTURE. That which is built upon above any defined level.

SUPERVISOR. This Latin term is usually translated SURVEYOR, but erroneously, if applied to the modern acceptation of the term in relation to architecture and building. "Supervisor signifies a surveyor or overseer. It was formerly and is still among some a custom, especially of the better sort, to make a supervisor of a will, but it is of little purpose. However the first might be good, that he should supervise the executor, and see the will truly performed"; HARRIS, *Lexicon Technicum*, fol., London, 1704, s. v. "Surveyor" is not explained. See SUPERINTENDENT for other titles.

"De Supervisor
Surveour and stuarde also,
Thes thre folke and no mo,
for not resayne, bot ever sene
That nothyng fayle and alle be whene;

That tho clerke of kechyn schulde
not mys,
Wrytes up the somme as every day,
And helpes to count, as I zou say."
—PERCY SOCIETY, *The boke of*
Curstowe, xiv cent., edit. by J. O. Halliwell, 1841, p. 23.

U U

- 1859 William of Wykeham was appointed Sup. of the king's works, generally translated "surveyor".
- 1365-6 William de Sleford was clerk and Sup. of the king's works at Westminster; BRAYLEY AND BRITTON, *Palace*, 8vo., 1836, p. 186; 198.
- 1403 In W. of Wykeham's will he mentions magistrum W. Wynford (as master mason), with dominus S. Membury sit supervisor et solutor dicti operis sit in futurum; or master of the works, not architect.
- 1408-9 Dom. Rob. Appilton, vicarius, sit Supervisor latomorum. Dom. Thos. de Haxey sit Supervisor operis iij te columpna.
- 1484 Overlooker to a will, Melford church, Suffolk; NEALE, *Churches*, 8vo., 1826, ii, p. 2.
- 1491-1508 Sup. of the works at Magdalen College tower, Oxford, not Architect; CHANDLER, *Waynflete*, 1811, p. 398-401.
- 1500 J. Alcock, bishop of Ely, appointed Sup. of the will of Thomas Scot, or de Rotherham, archbishop of York; HUNTER, *South Yorkshire*, fol., London, 1831, ii, 9.
- 1574 Lancelott Alford, Sup. estimator et extensor omnium et sing. manerium, etc., etc., British museum, Harl. MS. 4107, p. 41.
- 1586 G. della Porta and B. Ammannato were appointed to be Sup. over D. Fontana at the raising of the obelisk in the piazza di S. Pietro, but were got rid of by him.
- 1662 July 17 Sup. appointed by Act of Parliament for repairs of highways.
- 1696-7 In the Act of 8 and 9 William III, c. 14, "the annual stipend or allowance to the person who is or shall be Supervisor or Surveyor general of the building", i.e., S. Paul's cathedral; also 1710, 9 Anne, c. 17.
- 1702 John Ball, "fit Supervisor sive clericus operum regule inter honorem de Windsor."

SUPPLY or FEED CISTERN. A small cistern placed near the boiler of a kitchen range, to feed the boiler, it being itself supplied from the main cistern. It has the usual ballcock, and should have a small waste-pipe in case the former gets out of order, and this pipe should be syphoned and should not be laid into a drain, or into any trap. The cistern is fixed at such a level as will allow the boiler to be always full. A supply cistern is necessary for a wrought-iron boiler to a range or furnace for supplying hot water to a bath, etc., on an upper floor; but this cistern is generally closed, the pressure of water supplied to the boiler from the cold-water cistern being sufficient to force up the hot water, and from this hot-water cistern the hot water is carried by pipes to the places required. The American cylinder hot-water cistern is fixed somewhat above the level of the boiler, and circulates hot water by pressure of the cold water.

SUPPLY PIPE. See PIPE.

SUPPORT. SUPPORTER. The law of lateral support was decided in the *opinions* of the Judges on the questions of Law propounded to them in the cause of The Commissioners of H.M. Works and Public Buildings v. Angus and Co.; Dalton v. Angus and Co., fol., London, 1881. SMALLMAN SMITH, in SURVEYORS' INSTITUTE, *Reports*, Jan. 28, 1878, x, 83. ARCHITECT *Journal*, 1881, Jan., p. 2-3. BRITISH ARCHITECT *Journal*, 24 Dec. 1886, p. 602. KERR, *Consulting Architect*, 8vo., 1886.

COLUMN. PEDESTAL. PIER. PILLAR. STANCHEON. STUD. POST. SHORE. STORYPOST. STRUT. SUFFULCRUM. CARYATIDE. PERSIAN. MAINTAIN.

Isolated points of support, which sometimes carry great weights on a small superficies, are susceptible both of settlement and crushing, where the weight they have to sustain is greater than the force of the materials whereof they are formed. This renders the knowledge of the strength of materials an object of consequence in construction. The "ratio of the points of support in a building to its total superficies" is considered as regards public edifices in several tables in GWILT, *Encyc. of Architecture*, 8vo., 1876, § 1583; 2529-30; and for private apartments, § 2848-54. *Supports to the weights*, in GWILT, edit. of CHAMBERS, *Civil Arch.*, 8vo., 1822, p. 160; and his *Criticism*, 8vo., 1837, p. 13.

SUPPORT; To. A term in conjunction with "repair, sustain, maintain, and uphold", constituting one of the covenants of a lease.

SURBASE. An upper base. A cornice or series of moldings above a pedestal or stereobate. 1. 19.

SURBASED-ARCH. An arch struck from centres below its springing; one that comprises only a segment. SURMOUNTED. 19.

SURBISTAN, or Sarbistan. In Persia. See SASSANIAN Architecture.

SURDAUB; see SERDAUB.

SURETY. A party undertaking to be responsible for another person. *Builders' Sureties*, in BRITISH ARCHITECT, 1885, Nov. 6, p. 197.

SURFACE. The formation of a plane and of a winding surface to a stone, is explained in BUILDING NEWS *Journal*, 1876, xxx, 484, 507. ASHLAR.

SURFACE ARCADE. A term used for "blank arcade", as in the church of the Apostles at Cologne, in WEBB, *Cont. Ecclesiology*, 8vo., London, 1848, p. 44.

SURFACE DECORATION. R. O. HARRIS, *Surface Decoration*, read at ARCH. ASSOCIATION, in BUILDER *Journal*, 1862, xx, 183. W. PITMAN, *Surface Decoration*, read at SOCIETY OF ARTS, March 1870, gave suggestions as to the ornamentation of dwelling-houses, as well as of larger buildings. BUILDING NEWS *Journal*, 1870, xx, 212; 234; 251. MIDDLETON, at Royal Academy of Arts, Feb. 1887; as given in BRITISH ARCHITECT *Journal*, 1887, p. 133. "Some men will have their walls plastered, some pergetted and whytymed, some rough caste, some pricked, some wrought with plaster of Paris"; HORMANUS, *Vulgaria*, 4to., London, 1519, fol. 241. Colour. Paperhanging. Tinted cements. Scagliola. Sgraffito. Fresco. Distemper painting. Stencil. Mosaic. Tile. Intaglio. Plaster work. Paint. Fretwork. Parget work. Pane drawing. Diaper.

SURINTENDANT. An officer among the French officials; see INTENDANT.

SURMOUNTED ARCH. An arch higher than a semicircle. STILTED ARCH. SURBASED. 2.

SURRINA or SORRINA; now VITERBO.

SURVEY; SURVEYING or Planometria. The art of applying the principles of geometry and trigonometry to the measurement of land, for mapping or valuing purposes. SURVEYOR.

A "cadastral survey" is described in INSTITUTION OF SURVEYORS, *Transactions*, 1878-9, xi, pt. 1, p. 2. MUDGE AND DALBY, *Account of the Operations carried on for accomplishing a Trigonometrical Survey of England*, etc., by COLBY, 4to., 1799, iii.

Lenormant of Paris 1867 laid before the Academy of Sciences the results of his examination of a papyrus in the British Museum which he states to be the fragment of a treatise on Surveying. The areas of various regular and irregular figures are computed, as also the cubic contents of pyramids, etc. The papyrus may belong to the twelfth dynasty. *Ancient Terms applied to the measurement of Land*, in SURVEYORS' INSTITUTION, *Transactions*, 1883-4; and *Agrimones*.

FITZHERBERT, *The Boke of Surveyinge*, 12mo. (1523), 1539; 1546; 1567. LUCAR, *Treatise on Surveying*, named *Lucar's Solace*, 4to., 1590. LIGH, *Science of Surv. of Lands*, 4to., 1592. NORDEN, *Surveyors' Dialogue*, 4to., 1607, 1610, 1618. DIGGES, *A Book named Tectonicon*, etc., 4to., 1637. LEYBOURN, *The Compleat Surveyor*, containing the whole Art of Surveying of Land; also how to know whether Water may be conveyed from a Spring head, etc., fol., 1653; 3rd edit. enl. 1674; 1700; 1744.

DIX, *Treatise on Land Surv.*, 4to., edit. 1819. MALORTIE, *Treatise on Topog.*, etc., 8vo., 1825. BREESE, *Present Practice of Surv. and Levelling*, 8vo., 1846. GALBRAITH, *Trigonomet. Surv.*, 8vo., 1842. ROBSON, *Marine Surv.*, 8vo., 1834. SIBORN, *Topographical Surv. and Drawing*, 8vo., 1827. FROME, *Trigon. Surv.*, etc., 8vo., 2nd edit., 1852. LINTERN, *The Mineral Surveyor*, etc., and *Guide*, 8vo., 1873; and *Magnetic and Angular Surv.*, 8vo., 1881. MERRETT, *Science of Land and Engineering Surv.*, etc., 1863; 3rd edit., 8vo., 1878. NESBIT, *Practical Land Surv.*, 8vo., 1837; 9th edit., 1847; 12th edit., edited by W. Burness, 8vo., 1870. WILLIAMS, *Geodasy, Chain Surv.*, etc., 8vo., 1846. BAKER, *Railway Engineering or Fieldwork*, 8vo., 1848. GILLESPIE, *Land Surv.*, developed from five elementary principles; 1 the chain alone, 2 compass, 3 transit, 4 theodolite, 5 plain

table; 400 engr., 8vo., New York, 1862. QUESTED, *Art of Land Surv.*, 3rd edit., 1855; and *Railway Surv. and Levelling*, 8vo., 1846. BURR, *Practical Surv.*, 12mo., 1847. HASKOLL, *Engineers', Mining Surveyors', etc., Field-book, Setting-out, etc., and Tables*, 12mo., 1864; 4th edit., 1880; and *Practice of Engineering Fieldwork, etc.*, 8vo., 1858; and *Land and Marine Surv.*, 8vo., 1868. JACKSON, *Aid to Survey practice—route surveys of travellers, etc.*, 8vo., 1880. AIDE MÉMOIRE, 3 vols., 8vo., Lond., 1845-52. CASTLE, *Practical Treatise on Land Surv. and Level.*, 8vo., 1845; 1847. BOURNE, *Princ. and Practice of Eng., Trig., Subter. and Marine Surv.*, 2nd edit., 1845; 3rd edit., 18

"The surveying consists in making the working drawings, and giving the entire directions for the execution of the works. The settling of the accounts is a separate matter, and consists in investigating and adjusting the charges of the Builder's accounts"; John Sanders, in *Fourth Report of Commissioners of Military Enquiry*; Barracks; fol. 1807, p. 277. FENWICK, *Subterraneous Surveying, and the Variation of the Needle, etc.*, 2nd edit., 8vo., Durham, 1882.

SURVEYOR. A title which until perhaps the end of the XVI cent. appears to have been used for an overseer, director, or supervisor; later it was also applied to the duties of an architect and to the measurer of land; and it is given to the officer appointed under various authorities as District, and Town, surveyor, surveyor to a local board; also measuring and quantity surveyor. The "Town surveyor" often includes the duties of Borough engineer, and Borough surveyor; *Qualifications and Duties*, in *BUILDING NEWS Journal*, 1869, xvii, 6, 25, 43. BOULNOIS, *Municipal and Sanitary Engineer's Handbook*, gives the Appointment and Duties of the Town Surveyor, etc., 8vo., 1885. The difference between a Land valuer and a Land surveyor is very ably described in RYDE AND DONALDSON, *General Text Book*, 8vo., 1853, p. 577.

1100-35 temp. Henry I. A. de Malverne surveyor of works of a bridge over the river Wye.

1307-10 Surveyors appointed for repairs, at Westminster palace, R. de Refham, W. de Leyre, and J. le Couens; BRAYLEY, *Palace, etc.*, 8vo., 1838, p. 114.

1324-7 W. de Chayllowe, "surveyor of the king's works in the tower of London and palace of Westminster" (p. 125).

1359 William of Wykeham appointed "survioure", i.e., supervisor.

1365 R. atte Pytte, surveyor of the labourers and keeper of the tools; BRAYLEY, *Palace*, p. 244.

1535-6 The Act concerning the general Surveyors (of land) of our Sov. lord the king Henry VIII; 27 Henry VIII, *Statutes of the Realm*, p. 631.

1541-2 The court of surveyors of land, 33 Henry VIII, c. 39, p. 879.

1582 Surveyor, meant measurer of land; WORSOP, *Delection*.

1582 Edward Stanhope esquier our generall surveyor of our possessions of our duchy of Lancaster in the north partes. DOUTHWAITE, *Gray's Inn*, 8vo., 1886, p. xix.

1585 "An order—that it may be known if any lodge in the House who are not of the House, surveyors shall be yearly chosen to search all the chambers of the House;" seventeen were appointed for the three courts; *idem*, p. 101.

1610 Iuigo Jones appointed surveyor of the works to Henry, prince of Wales; and

1614-5 he was surveyor of the works to king James I. His place at the funeral in 1625 is shown in NICHOLS, *Progress*, 4to., London, 1828, iv, 1044.

1625-49 The "surveyors", temp. Charles I. of lands in Norfolk, Suffolk, Cambridge, Huntingdon, Essex, Hertford, Middlesex and London, Kent, Surrey, and Sussex, are named Harl. MS. 4706, p. 125.

1627 J. Johnstone, surv. of the bridge work at Newcastle; reputed of skill, etc.; 2s. per day to overlook; FULLER, *Hist. of Berwick*, 4to., p. 231.

1666 Sir C. Wren, Mr. May and Mr. Pratt were appointed to act in connection with the surveyors to the Corporation in the rebuilding of the city, and Mr. Hooke, Mr. Mills and Mr. Edward Formyn were to join them in the survey; PRICE, *Historical Account of the Guildhall*, fol., 1886, p. 218, from *Journal*, xlvii, fol. 120b.

1665 Surveyor of the Dresser, paid £27 7s. 6d.

1666 Sir C. Wren, appointed deputy surveyor-general. His place at the funeral 1694-5 of queen Mary was after the Aldermen of London; Brit. Mus., Addit. MS. 6309.

1669 Sir C. Wren appointed surveyor-general.

1675 At the building of S. Paul's cathedral, Sir C. Wren was surveyor-general; John Oliver, assistant surveyor and purveyor; Lawrence Spencer, clerk of the works; Thomas Russell, clerk of the cheque; Harl. MS. 4941, before No. 24; printed in *BUILDER Journal*, 1858, xvi, 761.

1678 James Ward of Langley near Windsor, surveyor, his capabilities; *BUILDING NEWS Journal*, 1870, xix, 375.

1683 Surveyor of the Great wardrobe; there being also a "Controller" with each a clerk.

1685 Land surveyor in the port of London (one of many).

1686 William Harbord, surveyor-general, to return home.

1689 That a model be forthwith prepared by an able surveyor for a chapel to be new-erected for this Society (Gray's Inn); DOUTHWAITE, *Gray's Inn*, 8vo., 1886, p. 148.

1711 "When I was at the Duke of Shrewsbury's my Lord Scarborough was—talking of his building, and they did agree there was no Building without a Surveyor, even when they agreed by the great; wch agrees with the advice Mr. Benson is always desiring to send you word you must be at the expense, wch in the main will be money saved, for a blunder in building is not to be repaired without a great expence and loss of time and labour;" CARTWRIGHT, *Wentworth Papers*, 8vo., 1883, p. 181; 200.

1721 J. Gibbs was surveyor to church of S. Martin in the Fields.

1737 Mr. Fleetcraft (i.e., Flitcroft) appointed surveyor to new church of S. Olave's, Southwark, at four per cent., abating one-half per cent.

BUILDER Journal, 1844, ii, 252.

1772 about. Charles Cole, crown surveyor, built in Ely place.

1814 Surveyor of the works not to be an architect; GENTLEMAN'S MAGAZINE, lxxiv, 165, June 29.

1856 A. Lance stated there were 2,000 surveyors in Paris.

1868 The Surveyors' Institution was established in London.

1886 Oct. 7, The Institute of Auctioneers and Surveyors was established in London.

1548-1761 Surveyor-general of Ireland. 1509-1612 Clerks general of the works and Buildings, incorporated with office of Director-general and overseer of the fortifications and buildings 1612-1766; later Surveyor-general, with comptroller of the king's works; RECORD COMMISSION, *Liber Munerum*, 1152-1827, fol., London, 1824; p. 57; 105-6; 106; 137.

1834 County Surveyors of Ireland. This office was instituted by the Grand Jury Act, 3 and 4 William IV, chap. 78; amended 1836, 6 and 7 W. IV, c. 116. It was the first public office for which a competitive examination was required. The duties comprised the designing and superintendence of the construction of all county roads, bridges and buildings, the management and supervision of their maintenance, and the guardianship of the public interests in matters connected therewith. Many other Acts adding to the duties of the officer.

"Surveyors and the Appraiser's licence"; opinion, in *BUILDER Journal*, 1860, xviii, 533.

Roman land Surveyors, WOOLLEY, *Agrimensores*, in SURVEYORS' INSTITUTION, *Transactions*, xvi, 1883-4, p. 191-230. Signs or marked stones employed by them; COOTE, *The Centuriation of Roman Britain*, in *ARCHAEOLOGIA*, 1869, xlii, 138; 142-3. LACHMAN, *Gromatici Veteres*, 8vo., Berlin, 1848-52.

RATBORNE, *The Surveyor, etc.*, fol., 1616. LEYBOURN, *The Compleat Surveyor*, 4to., 2nd edit., 1657; 3rd edit., enl., 1674; edit. by S. Cunn, 4to., 1744. WILSFORD, *Art of Building, etc.*, 8vo., 1659. ATWELL, *The Faithful Surveyor*, 4to., 1662. GWYN, *Qualifications of a Surveyor*, 8vo., 1752. JONES, *Every Builder his own Surveyor*, 8vo., 1809. REID, *Surveyors and Builders' Assistant*, 4to., 1848. SURVEYORS' INSTITUTION, *Transactions*, 8vo., 1868-86. MATTHEWS, *Plea for Culture in the Profession of a Surveyor*, read at SURVEYORS' INSTITUTION; printed in *BUILDING NEWS Journal*, 1870, xviii, 227-3. SCRIBNER, *Eng., Contr., and Surv. Pocket Table Book*, 10 edit., revis., 12mo., New York, 1878. *Spons' Architects' and Builders' Pocket Book of Prices, etc.*, 8th edit., 1881, gives list of fees, compensation claims, and assessments.

SUSA. Shush, Sus, and Shushan, in Persia; the site doubtless of the Shushan of queen Esther, of the Book of Daniel; and of the campaigns of Alexander the great. The winter residence of Cyrus. The remains of a building 343 ft. long and 244 ft.

deep were discovered 1851-2, consisting of a central square of 36 columns with square bases, flanked on the west, north, and east by a similar number with bell-shaped bases, the latter being arranged in groups of 12, or in double rows containing 6 each; the plan and dimensions of the colonnade agreed with those of the great hall of Xerxes at Persepolis; there are good grounds for supposing that both edifices were designed (though not finished) by the same architect. On another mound was probably the citadel; on another, called the central platform, LOFTUS found the remains of other buildings, and on the base of a column, a Greek inscription. More and deeper excavations have to be made. WALPOLE, *Remarkable Antiquities, in Travels*, 4to., 1820, p. 420-30. LOFTUS, *Inscriptions on the Columns and Bricks dug out amongst the Ruins of Susa*, fol., 19 pl., 1852. LOFTUS, *Researches in Chaldaea and Susiana, with Excavations at Warka and Shush, Svo.*, 1857. ROYAL SOCIETY OF LITERATURE, *On the Excavations in 1851-2*, by W. K. LOFTUS, read 28 Nov. 1855; ATHENÆUM, No. 1467, p. 1438. *Transactions of ROYAL SOCIETY OF LITERATURE*, v, new series. Mr. G. Aitchison, A.R.A., gave a description at the Royal Institute of British Architects of the coloured tile wall-works removed to the Louvre at Paris. E. Potier, in the GAZETTE DES BEAUX ARTS describes *Les Antiquités de Susa*, rapportées par la mission Dieulafoy au musée du Louvre; by whom the results of the excavations were published in *Antiquités de la Perse*, 1881. He found the entrance to the palace, with an inscription stating its erection by Darius (B.C. 521-485), and its destruction by fire temp. Artaxerxes (B.C. 471-424); he purposes to relate the discoveries in *Les Fouilles de Susa*; R.I.B.A., *Proceedings*, Nov. 1886, p. 27 and 59. The canal or tunnel of the river Kuran, described by major Rawlinson to the Royal Geographical Society, before Oct. 1845; BUILDER *Journal*, iii, 506. 14.

SUSA and SOUSA (Anc. Hadrumetum, later Adrumetus), in Tunisia, formerly one of the chief cities of Africa Propria, and later the capital of Byzacena. A Phœnician colony older than Carthago; ruined by the Vandals it was restored by Justinian; some extensive ruins were described by Abou Obeyd Bekri of Cordova; but at the present time the remains are of little regard beyond fragments and eight great reservoirs lying parallel to one another. 23.

SUSA (Anc. Segusium). A town in Northern Italy, situated on the river Dora Susina, with mediæval towers and gates. The white marble archway erected by Julius Cottius, son of king Donnus, about 8 B.C., in honour of Augustus, has one opening 25 ft. wide and 40 ft. high, its proportion is shown in GUILT, *Encyc. of Arch.*, Svo., 1876, p. 920; MASAZZA, *L'arco antico*, fol., Turin, 1750. WOODS, *Letters*, 4to., 1828, ii, 426. There are two other Roman arches. It is the see of a bishop. The cathedral, Lombard style, dedicated to S. Justus, has a campanile one of the finest and loftiest of its kind; the font, XI cent., is hollowed out of a block of the local green marble. A town house, two modern hospitals, a royal college, and several arcades of Gothic arches, are noticeable. VALÉRY, *Voyages en Italie*, 3rd edit., 1842; transl. by CLIFTON, Svo., London, 1841. 14. 28. 50.

The verde di Susa or Suza, is very like the verde antique but less durable; it is obtained from quarries at Foresto. POLZEVERA. 28.

SUSDAL, or Suzdal. An archiepiscopal city, in the province of Vladimir, in Russia. It was destroyed 1565 by Ivan IV. The bronze door of the cathedral was brought 997 from Greece by Vladimir. DOOR. 96.

SUSFITIUS or FUSSITIUS; see FUFICIUS.

SUSINI (FRANCESCO), is named with N. ARRIGHETTI and others.

SUSPENSION BRIDGE. A roadway for spanning wide rivers and valleys, suspended from inverted iron bows of chains or wire ropes, by means of rods; the bows are supported from the tops of stone piers erected at each end, and from thence carried down and firmly secured in the ground. The earliest

suspension bridge towards the end of XVI cent. is described as having been composed of cordage. 14.

BOW AND STRING. BRIDGE. CATENARIAN. CHAIN. DREDGE. Coir rope bridge is made by the native Indians by passing ropes, made of cocoa-nut fibre, over upright Bamboo poles across the river; these are twisted into one rope to form an inverted arch. Two other ropes pass underneath to hold the laths of the roadway; the two ropes on each side are connected together to act as suspension rods. ROPE BRIDGE. America used timber and rope for hanging bridges.

Taper chain suspension bridge, GOODWYN, in *Papers of CORPS OF ROYAL ENGINEERS*, iv; and fol., 1844.

Inverted arch suspension bridge, for railways by A. E. COWPER, described at INST. OF MECHANICAL ENGINEERS at Birmingham; CIVIL ENGINEER, ETC., *Journal*, 1847, x, 368; and xi, 8.

TUBULAR SUSPENSION BRIDGE at Chepstow; C. E., ETC., *J.*, xv, 396; xvi, 281; ILLUSTR. LONDON NEWS, 1852, July 24, p. 61.

SPURGIN CHAIN BRIDGE; BUILDER *J.*, 1853, xi, 328.

Iron suspension and trussed bridge; C. E., ETC., *J.*, xx, 156; 124 ft. span.

A chain bridge upon the Catenarian principle, as proposed by R. STEVENSON, is given in HAHN AND HOSKING, *Bridges*, Svo., London, 1843, clxiv, pl. 104-7; the span shown is 150 feet.

Suspension Railway bridge; at Stockton, 281 ft. span by S. Brown, failed; C. E., ETC., *J.*, 1849, xii, 7. At Dirschau junction, 4½ miles from Danzig, one of the finest of the sort in Europe, iron lattice arches each of 397 ft. span, 2,500 ft. long, by 63 ft. wide, six piers, cost £500,000; MURRAY, *Handbook to Continent*, 1865, p. 429.

WIRE SUSPENSION BRIDGE. 1850 Lewiston Niagara bridge, 1,042 ft. span, by col. Serrell. 1848 Wheeling, over the Ohio 1,010 ft. span, by hon. H. C. Ellet. 1848 Bellevue over the Niagara 758 ft. span, by H. C. Ellet, and completed 1855 by Roebling. 1826 at Pest. 1839 over the Usse, near Annecy, in Switzerland (28, p. 358). 1857 Clifton, 703 ft. span, as proposed by col. Serrell; B. *J.*, xv, 14 Nov. 1857. First one 1860-3, in British Columbia, on Trutch's principle, over the Fraser, at Spuzzem. 1834 Fribourg, Switzerland, 870 ft. span, by eng. Challey; C. E. *J.*, v, 224.

POPE, *Bridge Architecture*, Svo., New York, 1811. GILBERT, *Some properties of the Catenarian curve with reference to bridges of suspension*, 1820. R. STEVENSON, *Bridges of Suspension*, in EDINBURGH PHILOS. *Journal*, about 1820. NAVIER, *Mém. sur les ponts suspendus*, 4to., Paris, 1823. SEGUIN, *Traité sur Susp. bridges*, 5 pl., 1824. DUFOUR, *Pont suspendu en fil de fer à Genève*, 4to., 1824. GILBERT, *Mathematical Theory of Susp. bridges, with tables of Catenary curves*, 1826. PROVIS, *Susp. bridge over the Menai strait; and Conway bridge, from designs by T. Telford*, 17 pl., fol., 1823. CUMMING, *Iron bridges of Susp.; Menai strait, Conway, and Hammersmith; Account of others in England and Scotland; Strength of malleable iron*, Svo., 1824; 1828; 3rd edit. by T. Tredgold, Svo., . . . QUENOT, *Pont suspendu en fil de fer, à Jarnac*, 14 pl., 4to., 1828; *Particulars of Hammersmith Susp. bridge*, Svo., 1827. DREWRY, *Susp. bridges; strength of iron wires and bars*, Svo., 1832. FENWICK, *Mechanics of Construction, materials, roofs, arches, and Susp. bridges*, Svo., 1861.

ROEBLING, *Niagara falls and the International Susp. bridge*, 22 pl.; Paddock viaduct by J. Hawkshaw, 4 pl.; Denby Dale viaduct by the same, 3 pl.; Newark dyke bridge by J. Cubitt, 10 pl.; Mountain top Tract in Virginia by E. Ellett; etc., Svo., 1852; 1856. LEBLANC, *Une pont susp.*, fol., 1841. VICAT, *Pont suspendu à Argentat*, 4to., Paris, 1830. DEMPSEY, *Suspension bridges*, 4to., 1852. ROUTLEDGE, *Discoveries and Inventions*, Svo., 1876, p. 198. PENNY MAGAZINE, i, ii, iii, and v, 4to., 1832-6. CRESY, *Encyclopædia of Engineering*, Svo., 1861. HEBERT, *Eng. and Mechanic's Encyclopedia*, Svo., 1836. INSTITUTION OF CIVIL ENGINEERS, *Index*. NOUVELLES ANNALES DE LA CONSTRUCTION, fol., Paris, 1855, etc. ALLGEMEINE BAUZEITUNG, 1 Ser., 1836, pl. 71-7, at Freiburg; 1838, pl. 242, Cylinder arch at Mehadia in Hungary; 1845, pl. 658-9, at Cubzac; 2nd Ser.,

1848, pl. 182-4, at Seraing over the Maes; 1852, pl. 845, at Whelling over the river Ohio; and at Niagara falls; pl. 486-7, at Chepstow; and 1853, pl. 601, tower at Charing Cross, London.

SUSPENSION GIRDER and chains to bridges. "In the girder bridge, the material is subjected to both extension and compression, of which there are two varieties; one, which is subjected to diagonal strains, as the Lattice, Warren, and Tubular girders; and a second in which all the strains are confined to the upper and lower webs, as in the Bow and string; and Brunel's new girder, which is a combination of an arch and a suspension chain, each doing half the supporting duty." BARLOW, on *Combining Girders and Suspension Bridges*, read 1857 at British Association. BARLOW, *Mechanical effect of combining Girders and Suspension Chains, and the application of the system to practical purposes*; British Association at Oxford; *Builder Journal*, 1860, xviii, 526-7; 539-40. CIVIL ENGINEER, ETC., *Journal*, xx, 323; 1860, xxiii, 225. RANKINE, *Suspended Girder Bridges*, in C. E., ETC., J., 1860, xxiii, 351; 1861, xxiv, 4; 35; LATHAM, 126. Iron suspension trusses on 25 piers and two abutments form the bridge over the river Ohio at Louisville, Kentucky, 1867. Its total length will be 5,220 ft., the graded approaches being 2,500 ft.; the longest span is 360 ft.; and the bridge adapted for steam, horse, carriages, and foot passengers.

SUSPENSURA. The flooring or suspended pavement of the laconicum or vapour bath, as described by VITRUVIUS, v, 10, in the Roman Balneæ; and *suspensura caldarium*.

SUSSEX MARBLE. A very shelly limestone, closely resembling PURBECK MARBLE (SWANAGE STONE), except that the prevailing fossil in the former is usually a larger species of *Paludina*. Beds seldom exceeding a foot thick, range for long distances in nearly parallel courses throughout the weald of Kent and Sussex; and the variety called "Petworth marble" is almost as well known and as extensively used as the Purbeck marble. They are composed of an agglomeration of freshwater univalve and bivalve shells united by a crystalline carbonate of lime, of a pleasant green colour and some beauty. These beds are supposed to occupy geologically a higher place in the oolitic series than the Purbeck oolites. The wealden formation of Kent and Sussex (consisting in its upper part of a thick mass of bluish clay called by the older geologists the oak-tree clay, and in its lower part consisting chiefly of arenaceous beds) contains a few building stones of much consequence; at Horsham, Hastings, and Tilgate Forest, beds of sandstone occur suitable for building, and sometimes flagstones are met. Some of the slabs of the wealden series are occasionally used to cover the roofs of buildings in Sussex, but their weight and their very irregular texture oppose their general application at a distance from the quarries. Ironstone is disseminated throughout this lower part in the shape of irregular concretions, and also in laminated buff-coloured beds; *Builder Journal*, 1851, ix, 748. Petworth or Sussex so-called marble was largely used during the Early English period of mediæval architecture in England, for the long shafts and also for fonts. In XIII cent. it was much discarded for PURBECK MARBLE, as at Chichester cathedral; PALEY, *Manual of Gothic Arch.*, 8vo., 1846, p. 95-6; *Archæologia*, 1877, xlv, 156. When placed bedwise in old buildings these stones have resisted the action of time satisfactorily, provided that the earthy variety had not been used. A large quantity of Sussex marble is found on the estate of the hon. R. Curzon, at Parham Park, near Arundel, and well known as "Petworth marble", during the middle ages, was principally obtained from this source; but as there is now not sufficient demand for the material, the ground has been levelled; ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 30 May 1853, p. 6; and in B. J., 1853, xi, 387. It has been stated that these stones being considered expensive in king Henry III's reign, a method was found to make them of a cement composed of various materials, moulded into shape, and rendered as hard and as smooth as marble; *Archæologia*, 1786, iv, 104; WALFORD, *Scientific Tourist*, 12mo., 1818.

ARCH. PUB. SOC.

SUSTAIN, To; see **SUPPORT**, To.

SUSTAINING WALL and **RETAINING WALL**, for earth and water. The theory of the equilibrium of such walls presents two distinct problems, the first being to ascertain the value of the pressure exerted against a plane surface, by either earth or water; and the second being to ascertain the dimensions of a wall of a given form which will be capable of sustaining the pressure. This method was pointed out first by COULOMB (? *Théorie des Machines Simples*, new edit., 4to., 1821). MAHAN, *Civil Engineering*, 4to., 1845, p. 88, 176, 186-8. STRUT. 1.

SUSTERMAN and **SUTERMAN** (LAMBERT); see **LOMBARDO** (L.).

SUTH DURE. "At the side of the church was the principal door, which, as of old by the English, so even now is called the 'SUTH DURE', and is often mentioned by this name in the law-books of the ancient kings (SELDEN, *Dec. Scrip.*, p. xlij). For all disputes from the whole kingdom, which cannot legally be referred to the king's court, or to the hundred, or counties, do in this place receive judgment"; EDMER (about 1060-1120); WILLIS, *Arch. Hist. of Canterbury Cath.*, 8vo., London, 1845, p. 11. PARVIS. **SOUTH DOOR**.

SUTHES (WILLIAM); "by art he was in masonry exquisit"; "he was master mason of Windsor castle"; "a citizen and goldsmith of London"; and died 5 Oct. 1625, as stated in a long epitaph on the south side of the chancel of Lambeth church. AUBREY, *Natural History, etc., of Surrey*, 8vo., 1719, v, 248. TANSWELL, *Hist., etc., of Lambeth*, 8vo., 1858, p. 146. In 1860 Oct. the tablet was in the tower. Suthes was succeeded at Windsor by N. STONE.

SUTRI (Etr. *Sutrinum*). A town near Viterbo, in Central Italy. It was built by the Pelasgi, on a long insulated rock of tufa. The walls on the south side with its two gates, and porta Furia on the north side are ancient, the latter having a slightly pointed arch; the two other gates are modern. An amphitheatre of Statilius Taurus excavated in the tufa, 290 ft. long and 270 ft. broad, the arena 164 ft. by 132 ft., is almost in perfect preservation; CANINA, *Ant. Etruria marit.*, fol., Roma, 1846-9, pl. 21, considers this work to be Roman, most other authors, Etruscan. There are a large number of sepulchral chambers, with a church (madonna del Parto) in the form of a basilica having a nave and aisles, of an early period (before Constantine); all excavated in the rock; HUBSCH, *Alt Christl. Baudenk.*, fol., Berl., 1858, etc., pl. 6, fig. 10-11; p. 2; DENNIS, *Etruria*, new edit., 1878; ROCK-CUT CHURCH. It is the see of a bishop. The cathedral dedicated to the Assumption of the virgin is modern, with a campanile of XIII cent.; several other churches; and convents are not remarkable. Beyond the town was a magnificent bridge erected in XVIII cent., uniting it with the hills; it was destroyed about 1798 by the French; WOODS, *Letters*, 4to. 1828, i, 325. BONDI, *Memorie storiche, etc.*, Fir., 1836; and *Saggio Storico*, par. 1; also NIBBY. 28. 50. 96.

SUTRIS (FRIEDRICH), also called *Suster* and *Zustris*, supposed to be the Federigo di Lamberto of VASARI, *Lives*, v, 481, was born 1526 at Amsterdam; and son Lambert Sustris. He finished his education at Florence; was about 1579 painter and architect to duke William V of Bavaria, with a high pay for the time of 150 gulden quarterly. He is considered to have made the design for the church of the Jesuits at Munich, and certainly designed the choir, which was enlarged and rebuilt after the fall of the tower in 1590. Sustris may have designed the Wilhelmspalast begun 1579, he certainly continued it after the disgrace of W. Oekhl to whom it is also attributed; (it was later the residence of duke Maxberg.) He died perhaps in 1599. 68.

SUWEIDEH in Bashan; erected long before A.D. 105. PORTER, *Giant Cities*, 8vo., London, 1867.

SUYS (TILMAN FRANZ), born 1783 at Ostend, studied in the academy at Bruges, became 1807 a pupil of Percier at Paris, where 1812 he gained the grand prix, and went to Rome. Returning, he published with HAUDEBOURT, *Palais Massimi à Rome*, fol., Paris, 1818, with life of B. Peruzzi. In 1820 he

X X

became professor of architecture in the academy at Amsterdam; 1837 architect to king William I, and to king Leopold. At Bruxelles, he 1838 laid out the quartier Leopold; designed the pavillon Casaux; the hôtel d'Arenberg; 1842-50 the church of S. Joseph; the porte d'Anvers; the porte Guillaume (GOETHEBUER, *Choix des Monuments*, etc., pl. 85, p. 57); 1827-9 with Henri, the centre of six monolithic columns and decorations of the palais royal; completion (alterations commenced by J. de Greef) and decoration of the palace of the prince of Orange (*idem*, pl. 112, p. 75); after 1826, extensive range of hothouses in the botanical gardens (a plate is given in his work on the *Panthéon*); 1842-59 restored the exterior of the collegiate church of S. Michael and S. Gudule, and cleared the houses from the south and west sides; 1859 added a wing to the fine palace of the duke d'Arenberg (formerly of count Egmont and his descendants); designed orangery and hothouses at the pavillon de Tervueren (or by C. van der Straeten); country houses near Amsterdam, at Utrecht, and Zyst; baths at Zandfort; small church at Muyden; restored the cathedral at Utrecht; rebuilt the fine Lutheran church at Amsterdam with J. de Greef; 1832 restored the château de Bouchout, near Meysse, of XII cent. but much altered 1602; 1842 enlarged the church of S. Servais in the suburb of Schaerbeek and rebuilt the tower; and 1845 commenced the restoration of the church of SS. Peter and Paul at Anderlecht. He published *Panthéon de Rome*, fol., Brux., 1838, consisting of 24 pl. chiefly details of the capital of the columns full size; *Plan du palais de Justice à construire à Bruxelles*, fol., Brux., 1838; and *Project, etc.*, in *Maatschappij—der Bouwkunde*, fol., Amst., 1842. J. de Cranez was a pupil. He died about 1861. WEALE, *Guide to Belgium*, 8vo., 1859. LANCE, *Dict. Biog.*

"Suys Jun." designed 1853 the church of S. George at Antwerp—and perhaps the maison rue Royale, given in CASTERMANS, *Parallèle des Maisons de Brux.*, fol., 1854; pl. 80-3.

LÉON SUYS, 1849 designed the chapel of Ste. Marie Madeleine, or of the frères de la Doctrine Chrétienne, at Bruxelles.

SUZA MARBLE; see SUSAN, in Italy.

SWAG; see FESTOON, in decoration.

SWAGE. The action of hammering the metal into a mould or die, to form the face, edge, or top of a bar. It is supposed that a swage in the mediæval period was sometimes made like tongs, to stamp both sides at once, in the same manner that money was coined.

SWAGEMENTIS. "A playted pyller gatereth dust in the swagementis; columna striata pulueres colliget in striligis"; HORMANUS, *Vulgaris*, 4to., London, 1519, fol. 241: perhaps flutings.

SWALLES. In 1532 timber at Durham "was sawn into bordis, swalles, spars", etc.

SWALLOW'S NEST, in fortification; see CANARDIÈRE.

SWALLOW TAIL; see DOVE TAIL.

SWALVE or SWALLOW (JOHN) with R. Washbourn, mason, 1395 March, 18 Richard II, were engaged to heighten the walls of Westminster hall for two feet, according to a form and model devised by master H. Zeneley or Yevele, and delivered to them by Watkin Waldon his warden, receiving payment for their labour at the rate of 1s. per ft. lineal. Also to fix in the inner walls twenty-six souses, or corbels, and to carve them in conformity with a pattern shown to them by the treasurer, etc.; RYMER, *Fœdera*, edit. 1740, iii, pars. IV, p. 105, or vii, 794. BRAXLEY and BRITTON, *Palace*, 8vo., 1836, p. 437.

SWAN (ABRAHAM), published *British Architect or the Builder's Treasury of Staircases*, in 5 books, 60 pl., fol., 1745; 1758; *Designs in Architecture, Houses, interior decoration; for stone and timber bridges from 20 ft. to 220 ft. in one arch, etc.*, fol., 1757; *The Carpenter's Complete Instructor; designs for domes, cupolas, trussed roofs, etc.*, 55 pl., 4to., 1759; 1768; *Designs for 150 Chimney-pieces*, 54 pl., 8vo., 1768.

SWANAGE STONE, from near Poole, Dorsetshire. There are in the isle of Purbeck about one hundred quarries, more

than half being in the immediate neighbourhood of Swanage. The true PURBECK STONES or thin beds of shelly limestone, alternating with clays and sands, formerly considered as wealden, now as upper oolite, form the great staple of the stone exports from this district. They consist of an immense number of beds from a quarter of an inch to four feet in thickness, mostly very hard and close-grained, and separated from each other chiefly by beds of clay, varied with sandy and loamy, gravelly or marly, earth. A very great proportion of the stone beds are useless, either on account of their excessive hardness, friability, or softness. The upper beds are the well-known and beautiful "Purbeck marble"; beneath this, the thick beds of the harder kinds are adapted to sea-walls, fortifications, and other solid work, where minute cutting and rubbing are required. The more easily worked, or "freestone beds", are used for all kinds of architectural dressings, external and internal stone fittings, sunk and rounded work, such as sinks, troughs, granary and rick legs, and capstones, and in fact all those purposes where easy and clean cutting in work, and subsequent durability, are essential. The thin beds are employed for paving, which, when selected, is the best in the kingdom; and the very thin layers of tough limestone, or the tough fissile beds, are split into suitable thicknesses as tilestones for roofing. Prices, etc., are given in BRANNON, *Guide to Swanage*, etc., 1858; and reprinted in *BUILDER Journal*, 1858, xvi, 639.

The beds range in colour from a light cream to a very dark grey, and sometimes a brown. The upper bed is a whitish cream-coloured stone with a slightly oolitic structure, used for troughs, sinks, and steps; it was used for the lighthouses at Margate and the isle of Wight; the clock house of Dover pier; the prison at Winchester; the West India docks, London; the obelisk at Encombe park; and many churches, bridges, etc., in the vicinity; weight per cubic foot 151 lbs. Swanage stone 1860 was used for the facing to the London and Provincial Law Life Assurance Company's office, No. 21, Fleet street. At Swanage, it is used as roughly hammer-dressed in random courses, pointed with black mortar, with dressings of same stone tooled: also used for paving, curbs, pitchers, flatners, sinks, etc. Another variety is a dark grey stone almost entirely composed of univalve shells of the genus *Paludina* cemented together with an argillo-calcareous basis, takes a beautiful polish, and was formerly used for slender shafts; and is now often used for hall and library tables, slabs, chimney-pieces, etc. The stone from "Woodybide", near Corfe castle, was used for decorating the columns of the interior of the Temple church; *BUILDER Journal*, 1851, ix, 748.

SWANG. A term used in West Riding of Yorkshire for part of a pasture covered with water; *ARCHÆOLOGIA*, 1814, xvii, 160.

SWAPE. A north country term for a lever. SMEATON, *Eddystone lighthouse*; App. of Spurn Point Lighthouse, p. 186.

SWARKESTONE STONE. The quarry is situated about six miles south of Derby. The nave and tower of Normanton church, Derbyshire, appears of the same stone as that used for Swarkestone bridge, which is about three-quarters of a mile long, and about three miles distant.

SWART (PIETER DE), born at Rotterdam, made the drawings for FOKKE, *Chambre et lit de parade de S.A.R. Anne, princ. roy. de la Grande Bretagne*, fol., La Haye, 1759. He designed about 1769 the Delftsche poorte; 1766 the hotel for madame Patras at the Hague, later inhabited by H.R.H. prince Henry; and most of the best houses at the Hague in conjunction with his pupil J. Bergman. He died 1772 at the Hague. 24.

SWASTIKA; see SYMBOL.

SWATHE. The list or listel, or "the nether band or swathe of the column", this refers to the fillet above the torus in the base of the Doric order; MOXON, *Vignola*, 12mo., 5th edit., 1703; 1729 p. 22; but in p. 58, the term is given to both the upper and to the "nether or lower" torus of the Corinthian order.

SWEDISH ARCHITECTURE. There are four great periods

in Swedish history. I. The Pagan age, from earliest times to the end of x cent.; II. The establishment of Christianity as the religion of the country, early in xi cent., to the accession of Gustavus Wasa 1523; III. The age under the Wasa dynasty and their immediate successors to the battle of Pultowa in 1709; IV. From that time to the present. The early history is more obscure than that of Norway or Denmark. The Sviar under Odin were a part of the great Gothic tribe who had long before settled in the south part of the country. The "stone-age" graves at Falköping, in *BUILDER Journal*, 1886, Aug. 14, p. 228-9. Odin founded an empire around the Mälär lake, making Sigtuna, the capital, erecting temples, etc. Niörd succeeded Odin, and his son Frey (surnamed Yngoe), who removed to Upsala, where he built a temple which became celebrated. Olaf son of Eric was the first Christian sovereign, having been baptized about A.D. 1000 at Husaby in Westgothland by S. Sigfrid from England; many churches were built and three bishoprics established. During the regency of Birger jarl, 1250-75, Stockholm was founded.

The castles are legion, as Gripsholm, Skoploster, Vadstena, Upsala, Kalmar, Leckö, Beckaskog, Vik, etc.

The towns of Upsala, Stockholm, Lund, Strengnäs, Wisby in Gotland, Gothenburg, Kalmar, Gefle; these more or less exhibit the reflex of the architecture of other countries, as noticed under their names.

The native architects were N. and C. J. Tessin, father and son; C. F. von Hårlemann; — Adelcrantz; — Palmstedt; S. and J. de Lavalée.

The largest and most important monument is the brick cathedral at Upsala, 1287 by E. BONNEUL of France, until his death (date unknown); it was 200 years in progress. Church at Linköping, 1260-1500. Lund cathedral from about 1080-1150, its apse *cir.* 1100; Westeroas, Strengnäs; Abo, all XII-XIII cents. but greatly altered; Kalmar. Those in Gotland; at Wisby, dating about 1100, burnt 1175, rebuilt 1225. Many in the province of Scåne, and elsewhere. A great number of old churches date from XI and XII centuries; the Skara, and Olneby, cathedrals, Vämb's church, Vreta cloister, and Varnhem, cloister, churches, Riddarholm, Visingsö, etc. Those at Bjerlesö, Kumbla, Floda, Tegelsmora, Solna, Torpa, Ameneharads-Rada, and Risinge, are the churches principally given in MANDELGREN, *Monuments Scandinaves du Moyen Age*, etc., fol., Paris, 1862; reviewed in *BUILDING NEWS Journal*, 1871, xx, 239-40. GORDON, *Swedish Churches*, etc., with interior of Håbo-kyrka, in *ECCLÉSIOLOGIST Journal*, 1852, xiii, 30. MANDELGREN, *Notes sur l'exécution technique de nos vieilles peintures d'église*, etc., 8vo., Stock., 1872. The country churches of timber with tall wooden spires and detached belfries are of much interest. There are at least eight round churches, all of the Teutonic type, having naves with small apses—as at Hagby, Läderbro, etc.

The houses are chiefly of timber, of square logs without the carving or projections of those in Switzerland. The farm is a two-storied building with tiled roof, and painted of a dull red colour. In the towns, yellow or bluish white is used; of two stories; some have a stone basement a few feet high, the rooms are large, light, and lofty; no fireplaces, but close stoves of glazed yellow tiles, like a cottage piano, placed against the wall. Also BEAZELEY, *Notes on Domestic Buildings in Southern Sweden*, read at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1882-3, p. 117-28. 14, 28, 50.

DAILY, *Revue Générale*, 1840, *Emploi du bois, jusqu'au viii siècle pour des Eglises*, i, p. 159; 1841, ii, 401-7, *La maison d'Ornoes, châteaux forts et temples du xv siècle*; and 1872, xxix, *Le chauffage des habitations*, p. 155. DAHLBERG, *Suecia antiqua et moderna*, 3 vols., 325 pl. of buildings, streets, gardens, etc., fol., Holmiæ, 1693-1714. PERINGSKJÖLD, several works on Swedish monuments; as *Monts. Uplandia*, fol., 1710. HANDBOOK—Sweden: Stockholm, Upsala, etc., 5th edit., 1877. INGLIS, *Journey through Norway*, etc., 4th edit., 8vo., 1837. BOISSELIN, *Travels in Denmark*, etc., 4to., 1810. A. SMITH,

Sketches in Norway and Sweden, fol., Lond. (1847). BREMNER, *Excursions in Denmark, Norway, and Sweden*, 8vo., London, 1840. MARRYAT, *One Year in Sweden; visit to Gotland*, 8vo., 1862. STEPHENS, *Old Northern Runic Monuments of Scandinavia and England*, etc., fol., Cop., 1866-68, a fine work.

MAY, *Grammar of the Swedish Language*, 8vo., 1850; 1854, gives the weights and measures; 100 Swedish feet equal 97.410 English. *Swedish Building Law*, by BEAZELEY, at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Trans.*, 4to., 1886, p. 109. *Report on Technical Instruction in Sweden*, presented to Parliament, 8vo., 1869.

SWEDISH IRON. It has been suggested that the superiority of the Dannemora iron is to be attributed to its relative freedom from phosphorus and copper; but EGGERTZ found 0.03 per cent. of copper; PERCY, 737. Charcoal is exclusively used as fuel in smelting; and the Sheffield manufacturers of articles of steel of the highest quality prefer the hammered to the rolled bars. The Swedish iron is more crystalline than the very fibrous best Welsh, or the Low Moor irons. In 15 Feb. 1717, proclamation was made giving leave to import Swedish iron from any foreign ports but those of Sweden; the English smith at that period considered it best endured the hammer and was the softest to file, (4). The railings of Bloomsbury square were put up about 1725 of this iron, and fetched about 1875 a good price for making horse-shoe nails. The genuine Swedish Dannemora iron, mark (L), is supplied from Leufsta, in Sweden, to Jessop and sons, Sheffield (ads. from 1867).

The Swedish galvanised sheet iron, of charcoal iron plates, 1883 has been introduced in uniform plates of 21, 23, and 25 gauge, 4 ft. long and 2 ft. wide, strongly galvanised with zinc. They are considered to be practically indestructible, of great ductility, and little inferior to copper as to durability. Small strips resist a tensile strain up to 26 tons, and if cut across the sheet, to 22 tons. For roofing, it is cheaper and more durable than lead, and is not subject to the same expansion and contraction. On the continent it is used for best roofing work, the edges being merely turned up and folded over; and its ductility enables it to be used for circular works. D. Kirkaldy in 1883 made several experiments, Test No. 1342 R to 1364 for C. B. Ketscher. *BUILDING NEWS Journal*, 19 Oct. 1883, xlv, 605; *THE IRONMONGER Journal*, 1 Dec. 1883; *THE EUROPEAN MAIL*, 29 May 1884. Experiments at the fortress of Carlberg, Sweden, on English, French, and Swedish armour-plate resulted in the two last breaking to pieces, the former not cracking. The shots were of Swedish iron and showed great toughness as compared with the English shots; *BUILDER Journal*, 1863, 12 Dec., ix. Swedish iron marks are given in PERCY, *Metalurgy*, 8vo., 1864, *Iron and Steel*, p. 737. 14.

SWEDISH STONE. *Granites* from the Hufvudsta quarries near Stockholm, the general building stone of the city, a fine, clear grey; from the quarries at Malmö on the west coast, clear yellow or light brown; the Ornsköldsvik granite, dark grey; of the Dalecarlian granites, the most useful is the porphyroidal variety, the delicately coloured light red from the Gashvarf quarries at Elfdal, north-west of lake Siljan; of deeper colour and harder, is that of Roth, near Elfdal. *Marbles* from Claës-torp, fine clear green; Wickersvik, flesh-coloured; Sala in Westmania, light green; the finest among many others are the conglomerates from Dalelven near Transtvand; also in the Kolmorden ridge, north of Norrköping; and in a few other places. *BUILDING NEWS Journal*, 1867, xiv, 490. "Swedish marble" was used 1714 for paving the aisles of S. George's church, Great Yarmouth. STOCKHOLM GRANITE. 14.

SWEDISH TIMBER. The forests are very large, sometimes extending 80 miles in length, and over 25 miles in width. The export of timber is not in proportion to this immense extent. Coniferous trees and birch and oak and beech are obtained in the southern parts, while a great portion of the northern provinces is destitute of trees. Firewood is largely supplied as no coal is obtained; also charcoal for the mines and factories.

Towards the northern parts tar and pitch are extracted from the roots of the pine-trees. The Swedish fir-tree attains under favourable circumstances a height of 50 ft. to 80 ft., with 4 to 5 ft. circum., and yields logs of 20 to 35 ft. in length, by 10 to 16 ins. square; and from the smaller trees, *deals* 3 ins. thick by 7 to 9 ins. wide, and 12 ft. and upwards in length. The wood is of a yellowish white colour, soft, clean, and straight in the grain, with only small knots and very little alburnum or sap wood. It is liable to the heart and star shakes and occasionally to the cup shake, and is therefore only suitable for common building purposes, being about one-third cheaper than Dantzic, and 15 to 18 per cent. cheaper than Riga fir timber; LASLETT, *Timber and Timber Trees*, 8vo., London, 1875, p. 251-2. RIGA TIMBER.

The *yellow deals* from Stockholm and Gefle are nearest in quality to the best yellow deals of Norway, as regards their being at the same time durable and mellow; if they were as mellow as Christiania deals, they would be preferred on account of their full size and freedom from sap, but they are somewhat more disposed to warp; and have coarse knots. Hernösand and Sundswall sent yellow deals occasionally little inferior in quality to those from the two first Swedish ports; but the faults are more perceptible. The deals of Söderham and Schonwick are of a still harder and coarser nature than those last described. The yellow deals of Gottenberg although very free from sap, and durable, yet have the fault of being rigid, and unfit for the joiner; they are, however, well adapted for rough purposes, both in and out of doors, on account of their durability; BAILEY, *Fir Timber and Deals*, read at INST. OF BRITISH ARCHITECTS, 20 Nov. 1843. BUILDING NEWS *Journal*, 1867, xiv, 824-5; *idem*, 1868, xv, 741; 1875, xxviii, 393, records the supply of Swedish and Norwegian timber. *Marks on Deals and Timber*, *idem*, xv, 723, 5, 138.

SWEEDLAND. A black slate dug in Leicestershire; see PAVEMENT (p. 666).

SWEEP. A semicircular or oval form made by the hand, usually applied to a line of roads in landscape gardening for graceful access to the entrance of the mansion.

SWEEP OF A CHIMNEY. The compass at the bottom on the inside round about the hearth, sides, and back. GAUGER, *Mechanism of Fire*, 4to., London, 1716.

SWEET GUM TREE; see LIQUIDAMBER. GUM TREE.

SWEETMAN (JOHN), of Raheny, near Dublin, 1803 designed the pro-cathedral in Marlborough Street, Dublin, ARCHITECT *Journal*, 30 Dec. 1876, p. 390.

SWELLING; of a column, or swelled column; see ENTASIS. Of plaster; see EXPANSION. Of a frieze; see FRIEZE.

SWERIN; see SCHWERIN, in Germany.

SWETMAN (JOHN de), cementarius 1397 by will dated 14 May, was to be buried without the north door of the cathedral church at York, near the new chapter-house. BROWNE, *Cath. Ch.*, fol., London, 1838-47, p. 97, from Reg. G, 1352-1426, fol. 169.

SWIETENIA MAHOGONI; Mahogany (Sp. *el coavano*, or *alcevan*, and *caoba*, as in some English works). The beautiful reddish brown-coloured wood of which furniture and fittings are chiefly made since its introduction into England about 1724, succeeding to Cedar for fittings. It is of different degrees of brightness, much mottled and streaked, very little liable to shrink or warp, free from taste or smell, but if kept for some time an agreeable odour, the exudation of a semi-resinous juice, is perceptible. It takes a very high polish. Spanish mahogany was extremely beautiful in its waves, pattern, or feather, but it is now rarely to be obtained except at high prices according to the quality. The tree flourishes in Jamaica, Cuba, St. Domingo, Porto Rico, Central America and the East Indies. The *Jamaica mahogany*, though beautiful, is now only to be found at too great distance from the coast for export. *Cuba* and *St. Domingo* have since the abolition of the duty in 1845 increased their shipments; but the largest trees, and the extent of country throughout which they are to be found, affording a

supply which may be said to be inexhaustible, are in the region of Central America. It thrives in most soils but varies in texture and grain according to the nature of the soil; on rocks it is of a smaller size, very hard and weighty, of a close grain, dark colour, and beautiful shade; while on low and richer lands it is more light and porous, of a paler colour and open grain as the Honduras; on mixed soils it holds a medium. It is a lofty branching tree with a large spreading head, a very tall and straight stem usually 4 ft. in diameter; on account of the difficulty of its transportation from the forests, when the tree is of great thickness it is cut in short logs to equalise the weight. These giant trunks are as durable as, if not more so than, oak; the fibre is not subject to dry rot; it is more buoyant than English oak; preserves iron and copper better; and when vessels are broken up, the *débris* is valuable from the ease with which it can be transformed into all sorts of furniture. Generations ago the Spaniards used it for shipbuilding. Sir Walter Raleigh's ships were repaired with it in Trinidad in 1597, but it is only comparatively recently that it has been found to possess so eminently the properties of buoyancy, durability, non-shrinkage, and freedom from dry rot, as to obtain a place amongst the A1 twelve years' timber in Lloyd's List, and to be found especially adapted for the frames and planking of steam vessels for its non-liability to expand or shrink from heat or wet.

"Spanish mahogany" is the produce of the island of Cuba; yields timber from 18 to 35 ft. long by 11 to 24 ins. dressed quite square, and generally with two or three stops or joggles; or about 10 ft. long and from 20 to 26 ins. square. "S. Domingo" is similar but of smaller dimensions, 8 to 10 ft. long, by 12 or 13 ins. mean thickness; it has a good figured grain. "Nassau" is still smaller, 3 to 5 ft. long, 6 to 12 ins. square. "Honduras" is very tall; 40 to 50 ft. to the branches, 6 to 9 ft. circumference; yielding logs 25 to 40 ft. long by 12 to 14 ins. square. Moderately hard, strong, tough, elastic, but somewhat brittle when dry; does not shrink or warp much in seasoning, but is liable to split into deep shakes if dried too quickly. It is generally plain in character, but occasionally a curl is found. Carpenters, cabinet-makers, etc., use it; and in shipbuilding for beams, planks, etc., as a substitute for oak. It is found in vast forests thickset with brushwood; the trees growing in batches of from two to five: these are felled between August and October; squaring done to March with clearing and setting up the logs ready for trucking. In June the floods rise, the logs are floated down, hauled up at the port, re-dressed, and shipped. 250,000 ft. is a cargo for two vessels of about 400 tons; *How Mahogany is obtained*, in BUILDING NEWS *Journal*, 1869, xvii, 341, from THE SCIENTIFIC AMERICAN *Journal*. "Mexican" of Central America is very abundant. It yields the timber of commerce and is usually called "baywood", in squares of 15 to 36 ins. and 18 to 30 ft. in length. The wood is moderately hard, less strong, and the centre more soft, spongy, and "star shaky" than either of the other varieties. Tabasco, the districts of Frontera, Chiltepec, Santa Ana, and Tonalá yield excellent timber. Tables of experiments of each of these varieties are given in LASLETT, *Timber and Timber Trees*, 8vo., London, 1875, p. 171-80.

"African" mahogany, *S. senegalis*, or rather *Khaya senegalis*, is shipped from Gambia. It twists and is much inferior except for its hardness. Eucalyptus, or Jarrah, called Mahogany in West Australia, is proof against the white ant and sea worm, for 20 to 30 years; BUILDING NEWS *Journal*, 1861, viii, 288. SWIETENIA CHLOROXYLON yields the beautiful East Indian Satin wood; see CHLOROXYLON.

"Honduras" was first imported from near Belize about 1724-5; mahogany is noticed as used from about that early period. 1724 stairs and flooring at Marble hill, Twickenham, for prince George. 1722-35, wainscot of the little bed-chamber at Houghton, by T. Ripley. About 1740, the rooms in the rear of the earl of Tyrone's house, Dublin, were finished with it in the old heavy style, the workmanship of which is remarkably good; as was also

the staircase; by R. Cassels, CASH, *Views in Dublin*, 4to., 1780, p. 118. 1748 the stalls in Cordoba cathedral. Before 1828, the doors and sash-frames, solid wood, at the seat of col. Dixon, at Weeting, Norfolk. Staircase at Wycombe park for sir John Dashwood King, bart. Fittings in S. Andrew's church, Glasgow; and 1818 in Marylebone church, London. In 1776 is described "Best Jamaica wood, not the common spongy Honduras or Rattan, or the harder Madeira, which are not so good or so beautiful as wainscot"; CLAVERING, *Carpenter's, etc., Vade mecum*, 8vo., London, 1776, p. 18.

SQUIER, *Honduras*, 8vo., London, 1870, p. 129. APPLETON, *Dictionary of Mechanics*, ii, 307. SOCIÉTÉ ANGL. FRANÇAISE, *Notice sur les Acajous de la Baie de Honduras*, 4to., Paris, 1867. CHALONER and FLEMING, *The Mahogany Tree*, 8vo., Liver., 1850. *BUILDER Journal*, Jan. 1857, xv, p. 81, lecture at Society of Arts: xix, 779b, giving the size of a large log; xxii, 597. ILLUSTRATED LONDON NEWS, 1850, xvi, 228, gives a cut of a large log of Honduras. *BUILDING NEWS Journal*, *Furniture woods*, ii, 1856, p. 660, 682, 730; and *Satin wood*, 370; 753. 71.

To darken this wood quickly, it may be washed with lime-water, and when dry rubbed quite clean with a hard brush; then polished with turpentine and bees-wax, or linseed-oil; or be continually rubbed by the hand—a long process but giving the best result of polish for wear and appearance. Polishers will often lay a ground or body of red lead, whiting, and plaster of Paris, and then polish on this. It however, hides a great deal of the "figure" and the polish disappears. The whole should be taken off with potash and be recommenced. Fine polishing is only accomplished by means of laborious rubbing with the different French gums in their proper order, when gradually the whole figuring in the wood comes out. The polish often dries out on the side of a work in shade: sometimes the sun, or a strong light on the furniture, bleaches it after some years.

SWIMMING BATH. A large tank of graduated depth in which youngsters can be taught to swim, and where all can indulge in this healthful recreation; the ordinary bath being only adapted for cleansing the body. There are regular swimming schools at Vienna, Munich, Breslau, Berlin and Paris. The method of General Pfuel for teaching swimming in the Prussian schools is advocated in the PENNY CYCLOPEDIA. In 1869 occurred a discussion on swimming baths in the TIMES, and the SPECTATOR newspapers. It should be lined with white tiles, and have a depth of water varying from 4 ft. to 14 ft. renewed momentarily by a running stream. The dressing-boxes are to open directly on to the water's edge and not on to platforms. A bath at Uppingham school, Rutlandshire, by A. Young, is given in *BUILDER Journal*, 1882, xliii, 808. At Vienna "The Diana" by Forster and Ekel, has a basin 40 by 114 Vien. ft.; ALLGEMEINE BAUZEITUNG, 1843, pl. 510-4; and in *BUILDER Journal*, 1851, ix, 138-9; 186. BATH. BATH-HOUSE. BATHS and WASHHOUSES, *Detached Essay*. 14.

SWING BAR; see BAR, and DOOR BAR. *Swing scaffold*; see SCAFFOLD. *Swing door* (Gr. Cynchlides).

SWING or SWIVEL (AND BASCULE AND FLYING) BRIDGE. A movable bridge much employed in docks, in order to admit of the passage of shipping. It consists of two parts or platforms, their point of meeting being midway between the two abutments; each portion turning on a centre pivot and supported on rollers, the projecting portion being balanced by weights fixed in the framing at the other end. Executed examples of timber swing bridges are given in KRAFFT, *Plans, etc., de l'Art de la Charpente*, fol., Paris, 1805, pt. iii, pl. 30-41; Rolling bridges, pl. 42-3; Drawbridge, pl. 45; Bascule, pl. 49. A large one was erected near New York, 472 ft. long, in three spans, the central or rotary one being 218 ft. long by 52 ft. wide. A detailed account is given in THE SCIENTIFIC AMERICAN, cir. 1869. *La Propriété Journal*, pl. 14. NELSON, *Notes on Swing or Flying Bridges*, in ROYAL ENGINEERS, *Professional Papers*, 4to., London, 1845, vii, 48-52. DODDS, *Hydrostatic Soc. tr.*, in PRACTICAL MECHANIC *Journal*, 4to., 1849-50, ii, 28. INST. OF CIVIL ENGINEERS, Index s. v. Bridges, movable, swing.

ARCH. PUB. SOC.

The "Bascule" is another sort of flying bridge, where each half is raised up. One of 40 ft. span at Wellesley Lock works, pl. 111-2; and a Swivel bridge, *idem*, pl. 117-8; are given in HAHN and HOSKING, *Bridges*, 8vo., London, 1843. An act of parliament was obtained 14 Aug. 1885 for a bascule bridge across the river Thames below the Tower of London, to be erected from the design of sir Horace Jones, architect, and J. W. Barry, engineer; its centre way is to be 200 ft. in the clear by 50 ft. wide; the land spans being 60 ft. wide; a view is given in *BUILDER Journal*, 3 July 1886.

SWIPE. An old name for a DAMPER.

SWITHLAND SLATE, from near Loughborough, Leicestershire. A purple grey slate, stronger, more durable, and of greater specific gravity than the Welsh. It ranges from 6 ins. to 2 ft. in length; and one square weighs 9 or 10 cwt. The slates are generally fixed with oak pegs and laid in mortar. R. R. R.

SWITZERLAND (Lat. Helvetia; Ger. *Schweitz*; Fr. *Suisse*; It. *Swizzera*); and SWISS ARCHITECTURE. The LACUSTRINE or lake dwellings (Ger. *pfahlbauten*; Fr. *constructions Lacustrines*) were first discovered 1854 in the lake of Zurich; about 25 villages are known in the lake of Geneva; over 40 in Neuchâtel; and at other places. The latest village may have been in existence when Cesar crossed the Alps, and the oldest may be 2,000 years before; the dwellers were probably Celtic. The Helvetii appear about B.C. 110 for the first time in history. Roman roads traversed the country in every direction, and that nation ruled it for 300 years. The cities were Aventicum (now Avenches) one of the earliest; Augusta Rauracorum (Kaiser Augst); Vindonissa (Königsfelden) near Brugg in Aargau; and Thermen Helvetice (Baden). In 450 it was overrun by the Burgundians and Alemanni. Frank kings of the Merovingian dynasty restored order. At the beginning of VII cent., Columbanus, an Irish monk, with others, preached the gospel; the chapels then erected were the origin of the abbeys of S. Gall, Pfaffers, Disentis, Seckingen, Glarus or S. Hilarius, S. Leodegar of Luzern, Einsiedlen, and the munster of Zurich, XI or XII cent. with northern door and cloisters; and the door at Basle cathedral; Reichenau, 816; Romain-Motier, cons. 753; Granson; Notre Dame de Neuchâtel, from 927; Payerne; Gernrode in the Hartz, founded 960; then the Roman roads were re-used; hospices afforded shelter to travellers; X cent., Saracenic brigands appeared; Zurich, Basle, and Bern became free imperial cities; and 1273 Rudolf of Habsburg was raised to the imperial throne. The above edifices are named in FERGUSON, *History of Arch.*, 8vo., 1865, i, 562-8; and 591-3, where he states that "the details of the Swiss buildings are well worthy of the most attentive consideration, inasmuch as they equal those of Provence or the north of Italy in elegance of feeling and design, while they are free from the classical trammels which so frequently mar their appropriateness in those provinces." In his *Modern Architecture*, 1862, p. 365, he gives a view of the federal palace at Berne. The chief towns are Basle, Geneva, Zurich, Soleure (Solothurn), Schaffhausen, Neuchâtel, Vaud, Bern, Lucerne, Aargau, Fribourg, Thurgau, Sion, Graubünden, Ticino, S. Gall, Zug, Appenzell, Glarus, Valais, and Schwyz. "Molasse", a soft green sandstone; alabaster; gypsum; marble; with asphalt in the Val de Travers, are productions of the country.

HEER, *Præval world of Switz.*, edit. by J. HEYWOOD, 2 vols., 8vo., 1876. ZEILLER, *Topog. Univ.*, fol., 1640; 1726. *Délices de la Suisse*, 12mo., 1776. LABORDE ET ZURLAUBEN, *Voy. Pitt. de la Suisse*, 3 vols., 278 pl., fol., Paris, 1780-6. VIEUSSEUX, *History of Switz.*, 8vo., 1840, by the Society for the Diffusion of Useful Knowledge. SCHMIDT, *Antiq. trouvées à Avranches, etc.*, 4to., 1760. EBEL, *Manuel du Voyageur en Suisse*, i, 1823, gives a list of distinguished men of the country. SOMMERLATT, *Descr. des 22 cantons*, 8vo. and fol., Berne, 1840. MARTIN, *La Swit. pitt. et ses environs*, fol., 1835. PROUT, *Sketches from France, etc.*, fol., 1838. GAULLIEUR, *La Suisse hist. et pitt.*, 4to., 1855, etc. ETZEL, *Bridges and Viaducts of Switz.*, fol., 1857. HOCHSTETTER, *Schweizerische Architectur in Perspek.*, etc., fol., Carls., 1863;

Y Y

designs in colours (B. J., xxi, 769). FREEMAN, *Hist. and Arch. of Swit.*, 8vo., 1863. FREEMAN, *Certain early Romanesque Buildings in Swit.*, read at ROYAL INST. OF BRIT. ARCHTS., *Sessional Papers*, 1864. BLAVIGNAC, *Hist. de l'Arch. sacrée du IV^e au X^e siècle*, 8vo., and pl. fol., Paris, 1853. *Switzerland, etc.*, 96 eng. and 400 cuts, etc., 4to. (1880?). MEISTER, etc., *Baumaterialien*, fol., 1884. DRUCE, *The Architecture of Swit.*, in BUILDING NEWS JOURNAL, 1856, ii, 254-6; a useful paper. MURRAY, *Handbook to Switz.*, etc., 1838; 1879 gives a list of selected books and maps. RIPLEY AND DANA, *American Cyclopædia*, 8vo., 1876.

The canton of Zurich has long been regarded as the foremost in matters of education, and special attention to its schools of all classes; the scheme in the canton, and also the town, is described in ROYAL COMM. ON TECHNICAL INSTRUCTION, *Report*, 8vo., 1884, p. 19-21; 39, etc. The educational vote absorbs nearly one-third of the total expenses of the canton. The polytechnicum at Zurich, designed about 1865 by G. Semper, is stated to be larger than Buckingham palace. SWIRE SMITH, *Educational Comparisons — England, Germany, and Switz.*, 12mo., 1877. *Technical and Primary Education; Circular* to and replies of, H.M. representatives abroad, 8vo., 1868. McLAREN AND BEAUMONT, *Report on Weaving and other Schools*, 8vo., 1877. FRENCH MINISTRY OF AGRICULTURE; Comm. on Technical Instruction, 1863: *Report on T. I. in Germany and Switz.*, 8vo., Lond., 1869. 14. 28. 50. 96.

SWISS HUT and CHALET (Ger. *sennhütte*). The herdsman's hut is a log hut formed of trunks of pines notched so as to fit into one another at the angles of the building where they cross; the roof is flattish and weighted with stones to keep fast the shingle roof and prevent its being blown away. Such a building is rarely air or water-tight. Another sort is a mere barn or shed where hay is housed for the winter. Of the well-known Swiss house or chalet, constructed of thick planks, sawn, the ALLGEMEINE BAUZEITUNG, 1843, gives examples, pl. 532-5, at Festenbach; at the imperial hermitage; near Kreuth; and at Rothach; also pl. 560-3 from the Tyrol and Vorarlberg; another; and in Grindelwald. The best types of this class of house are at Meyringen. VARIN, *Arch. Pitt. en Suisse*, 48 pl., fol., 1866. GLADBACH, *Der Schweizer Holzstyl*, fol., Darms., 1863-8; and BUILDER JOURNAL, xxi, 784. KRAFFT, *Plus beaux Jardins, etc.*, fol., Paris, 1809-10, i, pl. 28-9, etc. 28.

SWITKOWSKI (PIERRE), lived 1720-86 in Poland.

SWIVEL. Something fixed in another body so as to turn round on it. A kind of ring made to turn round in a staple or other ring. Williams's (of Birmingham) "Patent Swivel Apparatus" was advertised as superseding folding doors.

SWIVEL BRIDGE; see SWING BRIDGE.

SWORDED. A term used in Lancashire for "ledged".

SYBIL; TEMPLE TO THE, or temple to Vesta at Tivoli, near Rome, is circular standing on a stylobate about 5 ft. high. The capital, of the Corinthian order 2.487 ft. diameter, is peculiar in having the ornament cut into it, instead of being *appliquée* to the bell. It was first re-used by sir J. Soane at the Bank of England. TAYLOR AND CRESY, *Antiq. of Rome*, fol., 1821-2. 1.

SYBTHORP (ROBERT DE); see SIETHORPE (R. de).

SYCAMORE; see ACER; HARE WOOD.

SYDNEY. A seaport town founded 1788, situated on the bay called port Jackson, and the capital of New South Wales, in Australia. Governor Macquarie caused a survey to be made with a plan for future buildings. There are now several suburbs; Pyrmont bridge leading to one was erected 1857-8. It is the see of a bishop. The cathedral, dedicated to S. Andrew, though the first stone was laid 1837, was 1858 in progress by E. T. Blacket, still incomplete in 1863 (*ATHENÆUM JOURNAL*, 1863, March 28, p. 434; BUILDER JOURNAL, vi, 623; xvi, 268; xx, 723). S. James, for gov. Macquarie; Christ church, completed by E. T. Blacket 1837 to 1850 (?); S. Philip's 1798 with a tower for eight bells, 1858 (B. J., xvi, 268, 595); S. George's presbyterian church by W. B. Field (B. J., 1858, xvi, 407); S. Mary Roman catholic cathedral 1858 in progress (B. J., xvi, 268; and

BUILDING NEWS JOURNAL, 1860, vi, 48) was totally burnt 25 Aug. 1865. Unitarian church by T. Rowe; with many (some 120) churches of other bodies; and a synagogue by T. Rowe. WALSH, *Ecclesiology of New South Wales*, in ECCLESIOLOGIST JOURNAL, 1851, xii, 254-65; and *Colonial Church Arch.*, *idem*, 1850, xi, 164; 1854, xv, 19-24.

The houses of parliament and government offices (competition 1860, B. N. J., vi, 313; B. J., 1862, xx, 65, 86); by W. H. Lynn of Belfast, estimated cost £650,000, Gothic; B. J., 1869, xxvii, 644-7. 1869-74 general post-office by James Barnett, colonial architect, of grey Moruya granite and Pyrmont stone (B. N. J., xvi, 122); government house, Elizabethan style; 1857-60 university, by E. T. Blacket, Perpendicular English style (B. N. J., iii, 1018; iv, 1007; v, 335; vi, 48); 1858- town hall with a public room 120 ft. by 60 ft., by F. Wilson; court house with extensive gaol adjoining; 1862-3 prince of Wales theatre, by J. F. Hilly (B. J., xxi, 691); new barracks; exchange, Corinthian order; 1855 royal mint; custom house, etc.; new hospital, by T. Rowe; banks, etc. (B. J., 1858, xvi, 268; 595; B. N. J., 1860, vi, 48); many by Mansfield brothers; shops, arcades, and warehouses, etc., by the Mansfields and by T. Rowe; and 1879 International Exhibition by J. Barnett. *The Town, etc.*, B. J., 1853, xi, 102. A good series of photographs is in the library of the royal institute of British architects. RIPLEY AND DANA, *American Cyclop.*, 8vo., 1876. WALLACE, *Australasia*, 8vo., 3rd edit., 1883, p. 155.

SYELLE and STYLE. A northern appellation for a common rafter in a roof; also LEVER. 1605, syling timber bought in Ireland (query oak); CHETNAM SOCIETY, *Shuttleworth Accounts*, 4to., 1856-8, xxxv, xli, xliii, xlvi, p. 165-7; 169.

SYENE, now represented by Assouan or Essouan. (Fr. Osuan.) On the right bank of the river Nile, in Upper Egypt. Few remains of the ancient city exist. A portion of a gateway to a temple, and a partly Roman pier in ruins, are the only vestiges of this once important city, as noticed in the DESCRIPTION DE L'EGYPT, fol., i, pl. 1. A. B. EDWARDS, *Up the Nile*, 4to., 1877, p. 272, 278-80. 6. 25. 28. 50.

SYENITE. Near Syene commences the granitic region of Egypt. PLINY states syenite was first called pyroposilos. URE, *Dict. of Arts, etc.*, 8vo., 1875, describes syenite as "a crystalline rock consisting of orthoclase-felspar and hornblende; also applied to hornblende, orthoclase, and quartz. Hornblende is the characteristic ingredient of syenite and serves to distinguish syenite from granite. The rock at Syene is not a true syenite; as having but little hornblende with much quartz and mica it approaches nearly to granite." WILKINSON, *Handbook*, 1867, p. 403 (p. 417 of later edit.), and 1880, p. 520, impresses upon the reader that the syenite of the ancients used for statues was really granite. The porphyry, verd antique and jasper quarries are in the same district, *i.e.*, between Manfalout and the Red Sea. GRANITE (p. 77). In the quarries at Syene is still a nearly formed obelisk 95 ft. long; the obelisk now at Heliopolis (640 miles distant), and many statues, columns, etc., were excavated here and transported (MOVING) down the Nile. The third pyramid at Geezeh was cased with it. The rose oriental granite, as Pompey's pillar at Alexandria, was supposed to be the syenite of the ancients. LEEMANS, *Dict. Rais. des Mons. Egypt.*, etc., 8vo., Leyden, 1839-40; ii, pl. 5, fig. 20, 31. IRBY AND MANGLES, *Travels, etc.*, 8vo., London, 1823, p. 9. BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 222. 1. 6. 14. 28.

Syenite occurs in Cyprus; in Hungary; in Galloway in Scotland, in a large part of the Criffle hill; the so-called granites (MOUNT SORREL) of Leicestershire nearly approach syenite; the Grooby, Markham, and Bardon Hill quarries show a change of the granite rock through syenite into greenstone porphyry. A fine syenite was discovered 1813 in Charnwood forest by Mr. Bakewell while acting for the earl of Moira; ACKERMANN, *Repository of Arts, etc.*, 8vo., 1813, ix, 160. This English material is extensively used for pitching and paving. The "granite" of the Channel islands, used for road metal, is a syenite or at least a hornblende or syenitic granite.

At Baveno is obtained a syenite, used in Turin and the north of Italy. In the church of S. Paolo at Rome are 82 columns and 8 pilasters of it; also the large column of the Vergine della Pace, at Naples, all obtained from the quarries at Monte Orfano; *BUILDER Journal*, 1862, xx, 924, of a light pink hue and close-grained, also used at the church of S. Carlo Borromeo at Milan, by C. Amati.

SYLLION (Lat. *selio*, *selionas*; Fr. *sillon*, furrow; *sillonner*, to plough a furrow). A term used in ancient terriers to denote a quadrangular allotment bounded on the sides by furrows. Synonymous (1400) therewith, was "Shott", also "Quarantino", hence the expression "Shott-free", i.e., exempted from rent or other expense (not "scot-free", i.e., exemption from taxes, scot and lot). A triangular piece of land in the same terriers is called a "Gore".

R. R. I.

An uncertain quantity of land; but from the instances stated in *CHETHAM SOCIETY, Whalley Abbey*, 4to., Man., 1849, iv, Gloss, p. 1127, it would appear that five selions made an acre.

SYLVESTER GRATE. A patent taken out 1832 and 1845 by John Sylvester for the complete and equal radiation of heat over the whole apartment. The fire is placed at the nearest possible level of the floor, on the old fact of making it on the hearth; the fire bars extend into the room, thus making a hot hearth of metal. In 1851 Stuart and Smith of Sheffield had added the use of massive and encaustic tiles to the hearth, which moves on rollers for the removal of ashes, when necessary; this is seldom required owing to the system of combustion; *ART JOURNAL* (ads.), Jan. 1851, xiii, gives three woodcuts. The "Sylvester stove" is similar in principle to that by Strutt of Derby; both are described with a cut in *Detached Essay*, HEAT, p. 9. A memoir of him is given in *INST. OF CIVIL ENGINEERS, Proceedings*, 1852-3, xii, 165. To him is probably due "the process for rendering stone, brick, and other absorbent materials impervious to water", referred to *s.v.* BRICKWORK, waterproof.

SYLVESTRINE. A branch of the BENEDICTINE ORDER.

SYMBOL. A visible object that exhibits to the mind of the observer things either not seen, or being abstract ideas, are not the objects of sense; *DUDLEY, Naology*, 8vo., 1846, p. 556-60. He adds, no resemblance of the object becomes possible, but yet the sentiment may be as effectually excited as if there were a resemblance. This is effected by the ideas habitually associated with the symbolical object. An idol may be an efficient symbol of the god; a lion, of fierceness, etc.; a flourishing tree, of vegetable fertility; a rock, of firmness and stability. In some instances a great number of different ideas may be represented by the very same symbol—in fine any symbolical import may be affixed to any object however incongruous, according as the fancy and feeling of the agent may be disposed. This license attendant on the use of symbols has often led into all the absurdities of mysticism and extravagancies of insanity. The words symbol and EMBLEM are often used indifferently to express the same meaning; but "symbol" may sometimes be used for "emblem" where the contrary would not be true; these terms are also mixed up with ATTRIBUTE. *ICONOLOGY*. NUMBER. MARK.

14 19.

Symbolism, unlucky perhaps, sometimes, as where the box of the pulpit in the church of S. Etienne du Mont (1624-56) is carried by a Samson kneeling on a dead lion and holding the jawbone of an ass; given in *ROUYER ET DARCEL, Art Arch. in France*, 4to., Paris, 1863-6; ii, p. 28-9, pl. 30. *ATKINSON, Symbolism unfavourable to Art*, in his *Art Tour to Northern Capitals*, 8vo., 1873, p. 383. *Symb. as influencing Christian Art, especially Architecture*, by G. H. BIRCH, in *BUILDING NEWS Journal*, 1871, xx, 406.

General works. The sarcophagus of the early Christians found in the CATACOMBS affords a larger collection of symbols, to be seen in the publications of BOSIO, ARINGHI, BOTTARI, and D'AGINCOURT. The old publications of CASALIUS, 1647; RIPA, by Castellini, 1666-9; by ORLANDI, 1764; VILLAVA, 1618; 1681; MANACHI, 1749-55; BOLDETTI, 1702, 1720; 1792:

BUONAROTTI, 1716; BOTTARI, 1737-54; ALLEGGRANZA, 1773; CAMERARIUS, 1627; 1590-1605; 1595: and many other references in GUENEBAULT, *Dict. Icon. des Monuments*, 8vo., Paris, 1845, p. 348.

The more modern publications comprise MUNTER, *Sinnbilder, ou Figures symbol.*, 4to., Altona, 1825. BEHR, *Symbolik des Mosais. cultus*, 8vo., Heidel., 1837. MONE, *Anzeiger für Kunde der Deutschen vorzeit*, 8vo., Carls., 1832-9, iv, 493, 502. RAUMER, *Geschichte der Hohenstaufen*, 8vo., Reut., 1829, vi, 457. SAINT MAUX, *Lettres sur l'arch.*; et la genie symbolique, 8vo., Paris, 1787. SCHROECKH, *Christliche Kirchen*, 8vo., Leip., 1772-1803; xxviii, 290. AUBER, *Hist. et theorie du Symbolisme religieuse*, 8vo., Paris, 1870-2. KALLENBACH, *Dogmatisch liturgisch. Symb. Auffassung der Kirch. baukunst*, 8vo., Halle, 1857. FORLONG, *Rivers of Life; Thought from the rudest symbolisms to the latest spiritual develop.*, etc., 4to., 1883. HARGRAVE JENNINGS, *The Kosciscrucians; Fire and Serpent worshippers; mystic symbols*, etc., 8vo., 1879. TWINING, *Symbols and Emblems of Early and Medieval Christian Art*, 4to., 1852. AUDSLEY, *Handbook of Christian Symbolism*, 8vo., 1865. CREUZER, *Symbolik und Myth. der alten Völker*, etc., 4 vols., 3rd edit., Leip., 1836-43; and 4 vols., 1836-43; with the suppl., MONE, *Geschichte des Heidenthum*, etc., 2 vols., 1822-3, comprising the Celtic, Scandinavian, etc., myths. LUNDY, *Monumental Christianity, or Art and Symb. of the Primitive Church*, 4to., New York, 1876. WEBB, *Continental Ecclesiology*, 8vo., 1848, index. WARING, *Stone Monuments*, etc., fol., 1870; and his *Ceramic Art in remote ages; essays on the Symbols*, etc., fol., 1875. ALGERNON, duke of Northumberland, *Incised Markings on Stone, in Northumberland*, fol., 1869; reviewed B. J., 1869, xxvii, 709. HOPE, *Symbols used by the early Christians and introduced into their constructions*, in *Historical Essay on Arch.*, 8vo., 1840, p. 159-164.

SYMBOLISM OF BUILDINGS AND ORNAMENTS. BARLOW, *On Symbolism in reference to Art*, read at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1859-60, p. 97-110; and in *BUILDER Journal*, xviii, 178; and *Essays on Symb.*, 8vo., 1866. WARING, *Romanesque Art in the South of France*, in R.I.B.A., *idem*, 1860-61. NEALE, *A Catena symbolica from writers of the Western Church*, 540-1736, in *ECCLIOLOGIST Journal*, 1850, xi, 217-226; xii, 3-10. WESTROPP AND WAKE, *Ancient Symbol Worship; Phallic idea*, 2nd edit., New York, 1875. *Medieval Architecture in KOLNER DOMBLATT*, Feb. 1848, and in *BUILDER Journal*, vi, 351. *Of a Church*, KING, *Eastern Cathedrals (Lincoln)*, 8vo., 1861-9, p. 288: "Most of the larger Lombard churches are interesting from the symbolical and hieroglyphical sculptures of the façades." *Symbolical objects used in worship*, represented on ancient Grecian buildings, are described in GWILT, *Encyc.*, 8vo., edit. 1876, p. 70. DURANDUS (died 1296), *Rationale*; or *Symb. of Churches and Church Ornaments*, transl. by NEALE AND WEBB, 8vo., Leeds, 1843. RAMÉE, *Hist. Gén. de l'Arch.*, 12mo., Paris, 1843, i, 319; ii, 309-22. PINNOCK, *Iconology, or Emblem. figures explained*, 12mo., Lond., 1830. DEVOUCOUX, *Eglise d'Autun*, 8vo., 1845, reviewed in *ECCLIOLOGIST Journal*, 1846, v, 70-2. WADE, *Melrose Abbey*, 8vo., Edinb., 1861. *Symbolism of Oriental Ornament*, by SIMPSON, read at SOCIETY OF ARTS, *Journal*, 15th April 1874; and in *BUILDING NEWS Journal*, 1874, xxvi, p. 414. *Symb. character of Ornamental Foliage*, at York; BROWNE, *York Cathedral*, 4to., 1838-47, p. 23. *To draw symb. forms*; OZANAM, in DALY, *Revue Générale*, 1847, vii, 93. DOVE, *Geometrical and other Symbols*, B. J., 1863, xxi, 245-6; and *Masons' Marks*, 273. DOBSON, *Symbolism of Church Plan*, *idem*, 1881, xli, 720. OLIVER, *Dict. of Symb. Masonry*, 12mo., London, 1853. VESICA PISCIS. 41.

SYMBOLISM OF COLOURS; WEALE, *Quarterly papers on Arch.*, 4to., 1843-5; and in many respects in FIELD, *Chromatography*, 4to., 1835, and 1841. PORTAL, *Des couleurs Symboliques*, 8vo., Paris, 1837. The black and white marble used in the churches at Pistoia, are supposed emblematical of the reconciliation of the parties of the Bianchi and the Neri; *Handbook*, North Italy, 1846, p. 434; while the casing with similar material, brown and grey,

called black and white, in alternate courses, as used at Genoa, was allowed only in buildings erected at the expense of the public, and of the Doria, Fieschi, Grimaldi, and Spinola families; the church of Sta. Maria Inviolata, erected soon after 1336 is so cased. BÉGIN, *Cath. de Metz*, 8vo., Metz, 1842. DIDRON, *Icono. chrétienne*, 4to., 1845; FAIRHOLT, *Dict. of Terms in Art*, 8vo., (1870).

SYMBOLS OR ATTRIBUTES OF TOWNS; AS ANIMALS, ETC. RAVENSHAW, *On the Winged Bulls, Lions, and other symbolical figures from Nineveh*; read at the ASIATIC SOCIETY, July 2, 1853 (LITERARY GAZETTE *Journal*, 1853, p. 725. Ori Apollinis (HORAPOLLO) Niliaci, *De Sacris*, etc., 8vo., Paris, 1551; transl. by CORY, *Hieroglyphics of H. N.*, 12mo., London, 1840. The façade of the duomo at Siena covered with ornaments and sculptures, among which are several animals symbolical of the cities which were allied to Siena at different periods; named in *Handbook to Central Italy*, 8vo., 1843, p. 183; the columns of the great doorway rest on lions, the emblems of Florence and Massa. The lofty doorway of the palazzo Comunale at Perugia has two griffins (for Perugia) tearing a wolf (for Siena), p. 224. DOVE, *Birds and wings as Symbols*; the paradise of Osiris and the mysteries and magic of temples, tombs, arkite cells, and pyramids, in *BUILDER Journal*, 1858, xvi, 688-90; and xvii, 38-40; *Circular Rock-marks and other Symbols*, *idem*, 1864, xxii, 487-9. F. D'AYZAC, *Zoologie Symbolique*, in DALY, *Revue Générale*, 4to., 1847, vii, 65, etc., as index and plates; from the abbey of S. Denis; see also v, 49, 65, 97, and 129. ROUEN; *Les Sculpt. Grot. et Symb.*, 100 pl., 8vo., 1882. *Symbolical corbels*, near Bristol, B. J., 1861, xix, 820. LION. GARGOYLE. SERPENT. TREE. SPHINX.

SYMBOLS OF THE SAINTS, by which they are distinguished in works of art, properly EMBLEMS, as in PUGIN, *Glossary*, 4to., 1846; in HUSENBATH, *Emblems*, etc., 2nd edit., 12mo., 1860; and in JERKINGHAM. JAMESON, *Symbol. in Christian Art*, in NORTH BRITISH REVIEW, June 1865. ALCIATUS, several works on *Emblems*, editions 1534-1781. ARCHAEOLOGICAL INSTITUTE OF GREAT BRITAIN, *Journal*, 8vo., London, 1845, i, 53 (79), 384. GWILT, *Encyclopædia of Architecture*, 8vo., edit. 1876, p. 1323. MORANT, *Indications of Dates*, etc., 8vo., 1870; reprinted from ARCHITECT *Journal*. OTTE, *Kunst Arch. des Mittelalters*, 8vo., Leip., 1854, p. 316-37, the last is the key to the symbols. SPONS' *Archts., Builders', etc., Pocket Book*, by W. Young, 12mo., 1876, p. 174-6. BRITISH ARCHITECT, for Oct. 13, 1882, p. 490. BOOK OF SYMBOLS FOR CHURCH NEEDLEWORK, 22 tinted plates, 4to.

SYMBOLISM OF METALS. FAIRHOLT, *Dict. of Terms in Art*, 8vo. (1870). GWILT, *Encyc. of Arch.*, edit. 1876, s. v. in Glossary.

SYMBOLISM OF FORM, as the sword, palm, etc. HOLLAND, *Cruciana*, etc.; and *Symbols derived from the cross*, 12mo., Liverp., 1835. MORRIS, *Legends of the Holy Rood*, xi, xiv, and xv cents. The form called "swastika", also filfoot, gammadion, crux gothica, croix gammée, and running thwarts, is described as the symbol of Odin, the hammer of Thor or Thor's hammer, mark, or the Hammer mark by STEPHEN, *Old Northern Runic Monst.*, fol., Cop., 1866, p. 509; referring to WESTROPP, *Pre-Christian Cross*, in GENTLEMAN'S MAGAZINE, July 1863, p. 78; Dr. L. MÜLLER, in *Royal Danish Acad. of Sciences*, proceedings, 5th ser., Section of Hist. and Phil., vol. iii; and separately *Religiose*, etc., 4to., Cop., 1864; signs early adopted on Christian monuments, and to the close of the Middle ages, particularly in England. SCHLEMMANN, *Troy*, 8vo., 1875, p. 16, 39, 157. Dr. GRAVES, in ROYAL IRISH ACADEMY, *Transactions*, xxvii, pt. 3; BUILDING NEWS *Journal*, 1879, xxxvi, 433. GREG, *Meaning and Origin of the fylfot*, in ARCHAEOLOGIA, 4to., 1884, xlviii. FERGUSSON, *Indian*, etc., *Architecture*, 8vo., 1876, note p. 17. As used in India, *BUILDER Journal*, 1883, xlv, p. 756. WALHOUSE, *The S. symbol*, in R. I. B. A., *Sess. Paper*, 13 Dec. 1880.

SYMBOLICAL COLUMN. One representing by a device some particular country, as the fleur-de-lis for France. 4.

SYMBOM (don JUAN), was in the service of king Dionis of Portugal (1279-1325), and planned the fortification at Arrayolos. 68.

SYMEON (abbot 1082-94), brother of Walkelin, bishop of Winchester, began the reconstruction of the abbey church at Ely on the largest scale, being the eastern arm, the transepts, the central tower, and probably a bay of the nave; SCOTT, *Lectures*, 8vo., 1879, ii, 108.

SYMMACHUS (Q. AURELIUS). A prefect well versed in architecture, who was ordered by the emperor Theodosius to inquire into the execution of a bridge erecting by Cyriades, A.D. 400; he began by reviewing the accounts; SYMMACHUS, *Works*, Mayence, 1693, iv, epist. 71; v, epist. 74; x, epist. 38-9. The direction of the works was first given to the senator Auxentius, and later to the consul and tribune Afrodissius. (APHRODISIUS.) The wealth of Symmachus was prodigious; he possessed at Rome, a town mansion on the Caelian hill, and several houses in the city, a dozen villas in Italy, many detached farms, together with estates in Sicily and Mauritania. He died after 404. 14. 59.

SYMMACHUS (Q. Aurelius Anicius), consul 522 with Boëthius; they were both superintendents of architecture. The former, who had shown great skill and taste in erecting his private edifices at Rome, was directed by Theodoric III, king of the Goths (cir. 489-526), to superintend the restoration of the theatre of Pompey, and in rebuilding at Rome and of certain cities in Italy. CASSIODORUS, *Var.*, iv, 51 (also i, 21, 25; ii, 34; iv, 30; vii, 6, 13, 15); records a letter praising Symmachus, who it is stated was beheaded by Theodoric, cir. 526. GIBSON, *Decline*, etc., 8vo., edit. 1854, iv, 268. HAWKINS, *Origin*, etc., of *Gothic Arch.*, 8vo., 1813, p. 34, 146, 242. 3. 14. 68.

SYMMETRY or CONFORMITY. "The design of temples depends on symmetry, the rules of which architects should be most careful to observe. Symmetry arises from proportion, which the Greeks call *ἀναλογία*. Proportion is a due adjustment of the size of the different parts to each other and to the whole; on this proper adjustment, symmetry depends"; VITRUVIUS, ii, chap. 1; who vii, pref., states that Sarnacus wrote a treatise on the *Rules of Symmetry*, time uncertain. It is the contrary opposition of equals and similars. "In the court which immediately follows the first pylon of the temple of Rameses III at Medinet Abou, is a remarkable instance of what sir G. WILKINSON has ingeniously called the 'symmetrophobia' of the Egyptians. This is bounded on one side by large columns whose capitals represent the half-opened bud of the lotus; but on the other side, are massive stone pillars to which are attached colossal statues of Rameses III clothed with the attributes of Osiris"; *Handbook to Egypt*, edit. (1867, p. 340), p. 211. *Sym. in Nature and Art*, *BUILDER Journal*, 1857, xv, 537. *Principle of Symbolism and its Development*, *idem*, 1867, xxv, 342-3. ANALOGIA. BEAUTY. DECOR. EURYTHMY. GEOMETRIC PROPORTION. 1. 14. 25.

SYMMONS (HENRY), between 1696 and 1698 was clerk of the works at Greenwich hospital.

SYMMONDES (SYMOND), of Westminster, with Frances Wylhamson of S. Olave, Southwark, glasyer 1526, covenanted "to glase and sett up" four windows of the upper story of King's College, Cambridge, equal to the king's new chapel at Westminster, and "according to suche patterns otherwise called *vidimus*" given to them; BRITTON, *Arch. Antiq.*, 4to., 1807, i, 15. 19.

SYMONS (ALFRED). An error for R. SIMONS.

SYMONS or SYMONDS (RODOLPH); see SIMONS (R.).

SYMPATHETIC HINGE. A memorandum states that at a building, a hinge of this name was 1789 taken off and replaced by Stedman's patent centre-hinges. When swing and other folding doors are required to open both at once, a subterranean connection between the centres is made. This may be done either by an endless chain crossing in the middle and wound round barrels on the centres; or the centres may be connected with a stiff rod working on cranks attached to them; HINGE. A variety was made 1840 and is still used at Somerset house, London; they are somewhat dangerous to timid persons, as the fingers are apt to be caught on the doors closing. SWIVEL.

SYNAGOGUE. An assembly of Jews, and a building devoted to their public religious rites, corresponding in both senses to the word "Church" in Christian terminology. Jewish Law, otherwise so comprehensive and minute, offers but scanty instruction with regard to synagogue architecture. On the subject of site there is only one Talmudic rule, and that prescribes that it shall be chosen in the most elevated part of the town (Tos. Meg. iii). Like many other Talmudic ordinances, this has become a dead letter, though not without some attempt on the part of the Hebrew casuists to adapt it to altered circumstances (Schulchan Aruch. Or Chay. 150, 2). With regard to structure, there are only two rules, one relating to height, the other to entrances. Following the example of the Jerusalem Temple, it is enacted that the synagogue shall overtop the surrounding houses. The misfortunes of Jewish history have rendered it difficult to observe this law, and it has been very generally broken or evaded. Chayim Benveniste, a leading rabbi of the seventeenth century, decided that it was wiser to disobey the Talmudic regulation than to stimulate the jealousies of the dominant population by the erection of imposing edifices. In Poland the same view was adopted by prominent rabbis, but an attempt was made by the zealots to satisfy the law by the erection of tall iron rods on the roofs of the synagogues. The practice was imported into Germany, and Bodenschatz, writing in 1748, describes synagogues on which such rods were erected. As late as 1786 rabbi Joseph Teomin of Frankfort-on-the-Oder, advised the maintenance of the rods. At the same time, in order to conform to the scriptural verse, "Out of the depths have I cried unto thee, O Lord" (PSALMS, cxxx, 1), it was usual to build the synagogue itself at a slightly lower level than the entrance and vestibules. On the continent, orthodox synagogues are still sometimes arranged on this plan. The law relating to entrances prescribes that they shall be on the eastern side of the building, as was the case with the Tabernacle. (EXODUS, xxvi, 18, 20, 22, 36). This law has become modified by the geographical distribution of the Jews and the regulation with regard to the orientation of synagogues. The Talmud enacts that "all the worshippers in Israel are to have their faces turned to that part of the world where Jerusalem, the Temple, and the Holy of Holies are" (Berachoth, 30a). Hence when, in process of the Dispersion, it became necessary to place the ark at the eastern extremity of the synagogue, the doorway was removed to the west. The earliest reference to the change is found in the writings of rabbi Moses ben Meir of Ferrara, a Tosaphist of the thirteenth century. Many ancient synagogues in the East retained the eastern door, even when it was necessary to place the ark on the south or north side. Maimonides found synagogues arranged on this plan in his time. It is now tacitly understood that the entrances should always face the west. In some of the synagogues in London, panic-exits have recently been opened behind the Holy of Holies, and thus unconsciously the obsolete regulation of the rabbis has been partially satisfied. Closely allied with this subject was the question of windows. In accordance with DANIEL vi, 10, the Talmud requires that prayers shall not be offered up in a windowless house. Following the same rule, the windows were originally placed only in the eastern wall, and to this day small windows, usually of an ornamental character, are inserted above the ark. Synagogues might, however, dispense with windows when they were without roofs. That such synagogues were not of rare occurrence in ancient times is shown by the remark of Epiphanius: "There was a place of prayer at Sichem, now called Neapolis, without the city in the fields, in the form of a theatre open to the air, and without covering, built by the Samaritans, who in all things imitated the Jews." Peter della Valle describes a similar synagogue at Aleppo in the fifteenth century; and Azulai, three centuries later, saw in the synagogues at Jerusalem arrangements for open-air services. The Zohar requires that every synagogue shall be furnished with twelve windows, a prescription adopted by Joseph Karo, whose

ARCH. PUB. SOC.

codification of Jewish law is now generally followed. In the XVI century a synagogue was built on this plan in Vienna. On the other hand, at Misser, not far from Cairo, is an ancient synagogue, marking the spot where Jeremiah is said to have prayed, which is furnished with thirty-six windows.

With regard to external design there are no rules, but some oriental bias is observable in almost all the synagogues mentioned in the subjoined list.

In internal arrangement the synagogue follows the example of the Temple, by its three divisions of synagogue proper, reader's platform, and Holy of Holies. The latter is formed by a recess in the eastern wall, in which the ark is placed, with a curtain hanging in front. In Sephardi synagogues there are no external curtains. The ark should be detached from the niche so that in case of necessity it may be removed. A lamp perpetually burning is suspended in front, and accommodation for the preacher is provided either in the shape of a pulpit at the side, or a movable reading-desk in front. A certain number of steps lead up to the ark. The reader's dais is sometimes combined with the platform of the sanctuary at the eastern end, or is in the middle of the building. In the Basilica at Alexandria it was in the middle, and Maimonides adopted this example as fixing the rule. He has not been followed by other legalists. Karo mentions synagogues in his day (*ob.* 1575) in which the platforms were at the eastern end; he adds that there is no binding rule on the subject, and accordingly he gives none in his codification of Jewish law. All the English synagogues have their reading platforms in the middle, but on the continent the finest synagogues—such as, for example, the great Paris synagogue in the rue de la Victoire—are arranged upon the far more effective plan of combining in one broad sweep the sanctuary and reader's platform. By this arrangement all the seats in the main body of the building may be made to face the east, in strict accordance with the law. In the oblong English synagogues, the seats face north and south, and only at certain portions of the services the worshippers turn to the east. Special seats are provided for the elders of the congregation. In the German synagogues these are placed at the east end of the reader's platform facing the ark. The Sephardi synagogues provide a pew, or *banco*, as it is called, on the northern side facing the platform. Synagogues in which the sanctuary and platform are combined, have seats for the elders at the sides of the ark. The ancient practice was to place such seats in front of the ark, and their occupants sat with their faces to the people. The famous Alexandrian synagogue had seventy-one golden chairs, so arranged for the Sanhedrin. The synagogue at Bagdad was similarly appointed. The ascent to the Holy ark was composed of ten marble steps, on the uppermost of which were the stalls for the Prince of the Captivity and other princes of the House of David. There is a fourth division in modern synagogues in the shape of a gallery for women. This was quite unknown to the ancient Jews, who made no provision for a separation of the sexes during divine worship; on the contrary, according to Jewish law, women were on a perfect equality with men in religious duties and privileges. In the time of Maimonides there was no permanent division of the sexes, and it was not until the casuists set themselves to a study of the whole question that such a division was instituted. It does not date further back than 1250. At one time the division was so strict that female worshippers were placed in a compartment by themselves with one solitary window, and that trellised, looking into the synagogue proper. To this day the gratings in front of the ladies' galleries in orthodox synagogues are sometimes raised to such a height that it is quite impossible to see the female worshippers from below.

Of interior decoration, the synagogue knows hardly anything. The Johnson MSS., discovered a short time since at Hull, mention a synagogue established in that town in the seventeenth century, the interior of which was ornamented with portraits and statues of Biblical personages. This is not the only reason

Z Z

for doubting the genuineness of the MSS. in question. It is usual to place the Tablets of the Law, inscribed with the initial words of the Ten Commandments, over the recess containing the ark. Occasionally the "Seal of David", or interlaced triangle, is added. The prayer for the reigning family is generally inscribed on the walls; sometimes also the names of martyrs or benefactors. *Talmud Jer. Megillah*, cap. iii; MAIMONIDES, *Yad-Ha-Chazaka*, *Hilchoth Tephilla*; Löw, *Der Synagogale Ritus*, 1884; DUSCHAK, *Geschichte des Jüdischen Cultus*, 1873; HAMBURGER, *Real Encyclopädie für Bibel u. Talmud*, Part II, art. "Synagogue". L. W.

After describing the remains of the structures, clearly synagogues, at Kefr Birim, ROBINSON, *Biblical Researches*, 8vo., 1856, iii, 71-6; 3rd edit., 1867; notices those at Meiron, and at Irbid, Tell Hum, Kides, etc., in Galilee; the splendour of these edifices does not belong to a scattered and downtrodden people, such as the Jews have been in these regions since the IV century. "The synagogues of this period (cir. 381) appear to form a distinct class of building from either temple or church—with entrance to the south or facing Jerusalem—at present they are only to be found in Galilee, so that perhaps it would be more strictly correct to say that they face to the south. The architecture appears as though it were an adaptation to the Jewish wants, of the style of existing temples in the Lebanon"; WARREN, *Orientation of Ancient Temples*, etc., 8vo., 1875, p. 40. OLIPHANT, *Haifa*, 8vo., 1887, p. 239, describes the synagogues of Northern Palestine, apparently refuting the above. The recently discovered synagogue at Sufsat, in Palestine, is given in *BUILDER Journal*, 1878, xxxvi, 512. SOLOMON; temple of. HEBREW ARCHITECTURE. 14. 19.

XII cent. WORMS; *BUILDER Journal*, 1867, xxy, 9, and plate.

XIII or XIV cent. PRAG; SCOTT, *Church Restoration*, 8vo., 1850, note K. (cir. 1316?). B. J., 1866, xxiv, 850; *idem*, 1867, xxy, 9; *idem*, 1883, xlv, 203, restoration.

XIII cent. FRANKFURT ON MAIN; same as at Prag. Plan of singular vaulting in WEBB, *Cont. Ecclesiology*, 8vo., London, 1848, p. 95, who says it is third pointed, at end of XV cent. B. J., 1867, xxy, 9, which notes it is perhaps destroyed.

MAGNESIA; MACFARLANE, *Constantinople*, 195.

Bef. 1160. GLOUCESTER; north side of Eastgate street formerly Jewry street, said to have consisted of 4 pointed arches; the floor now nearly 7 ft. below the street; now or lately occupied as cellar by Mrs. Bond. BURY S. EDMUNDS; Moyses hall, said to have been a monastery, and used as a Syn. NORWICH. Vault; supposed Syn. before expulsion. Music house or Moyses' house locally attributed to the Jews.

1183. The synagogues at Estampes and Orleans were consecrated as churches; FREEMAN, in *GENTLEMAN'S MAGAZINE*, 1860, ix, 526-7, who suggests that the church of Notre Dame at Estampes, an extraordinary edifice, may be the one.

1283 and 1363. All the synagogues in London were ordered to be destroyed or closed. Expulsion 1290; return to England, 1656-7.

1290. "The London Jewry"; by J. JACOBS, in *JEWISH CHRONICLE*, 13 May 1867, with plan.

VALENCE; JEWRY. CARPENTRAS; Syn. and Jewry gate: map 1276.

1350 TOLEDO; El transitu church is without a rival in the world; formerly a Syn., now a matchless ensemble of Hebrew, Gothic, and Moorish art. B. J., 1863, xxi, 347.

1350 "S. Benito and Sta. Maria la Blanca; formerly Syn. VILLE AMIL and ESCOSURA.

1656 LONDON. King street, Aldgate; Portuguese, first in England; destroyed and superseded by the following one.

1698-1702 "Bevis Marks; Spanish and Portuguese. Oldest in use in England.

1736 "Church row, Fenchurch street.

1788-90 "S. James's and Duke's place, Aldgate (Ger.); by J. Spiller.

1815 "Maiden lane, Covent garden, is a very old Syn.

1878-9 "S. Petersburgh place; by N. S. Joseph and mess. Audley; *BUILDING NEWS Journal*, 1877, xxxiii, 28 and plate. Also 1878, p. 779.

"Western Syn., S. Alban's place, Haymarket.

1837-8 "Great S. Helen's; by J. Davies; *CIVIL ENGINEER*, etc., *Journal*, i, 339; ii, p. 1. *ILLUSTRATED LONDON NEWS*, v, 389. *MIRROR Journal*, 5 and 12 Jan. 1839.

1862-3 "Chichester place, Harrow road; by N. S. Joseph and E. Salomons. I. L. N., 21 Feb. 1863.

1865 enl. "Upper Bryanstone street; Portug.; by H. H. Collins.

1868 LONDON. Upper Berkeley street (competition B. J., 1867, xiv, 499); by H. D. Davis and B. Emanuel. I. L. N., 1870.

1869 "Central Syn., Portland road; by N. S. Joseph; B. J., 1869, xxvii, 887; and I. L. N.

1876 "East London Syn., Stepney green; by H. D. Davis and B. Emanuel.

1868 "North London Syn., Barnsbury; by H. H. Collins; I. L. N., 9 Oct. 1868.

1880 "Marlborough road, S. John's wood; by H. H. Collins.

1885 "Dalston Syn., Poet's road; by N. S. Joseph.

1886 "Spital square; German; by L. Solomon.

1867 "Walworth; Borough Syn.; by H. H. Collins; I. L. N., 4 May 1867.

1880 GLASGOW; Garnet hill; by J. McLeod; B. J., 1881, xl, 278.

1869 CHATHAM; by H. H. Collins; B. J., 1870, xxviii, 726-7.

1871 BRISTOL; by H. H. Collins. Others of note are at LIVERPOOL (2); MANCHESTER (4); PORTSMOUTH; BIRMINGHAM; BRIGHTON; RAMSGATE.

1845 SYDNEY; first one therein. 1853 MELBOURNE.

JERUSALEM; fine modern Syn.

AMERICA, New York; Temple Emanuel at corner of 43rd street;

Saraenic style. RIPLEY and DANA, *Amer. Encyc.*, 1875, xii.

MISKOLCZ; by L. von Förster. ALL. BAUZ., 1876, pl. 16-7; 19-22.

VIENNA; *idem*, 1859, pl. 230-5. Another 1885, in VI Bezirk; after the ancient Prag Syn.; by Max Fleischer.

OPEN-FEST; one of the richest in Europe; by L. Förster; view in FERGUSON, *History*, 8vo., 1863 (modern), p. 363.

AMSTERDAM; four, that of the Portuguese is perhaps the largest. Two large German Syna. HAMBURG; a new Jewish temple and seven synagogues, one dated 1786.

ALT STRELITZ; DALY, *Revue Gén.*, 1847, vii, 220.

BRUXELLES; *idem*, 1868, xxvi, 22; xxvii, 253; 1880, xxxviii, 641.

1812 BORDEAUX; by Corcelle, served as the model for that at Paris.

1864-9 TURIN; by Antonelli of Novara; B. J., 1876, xxxiv, 859. (Not completed.)

DRESDEN; by G. Semper; ALL. BAUZ., 1847, pl. 105-7. Timber dome 69 ft. diam.

1819 PARIS; Temple rue Notre Dame de Nazareth; by Sandrié feu; GOURLIER and others, *Edifices Publics*, fol., Paris, 1825-36, i, pl. 195. This was rebuilt 1850-1 by Thierry, MONITEUR DES ARCHITECTES, Sept. 1853, xix, pl. 220-7.

1874 "rue de la Victoire, and place Royale; by Aldrophe; DALY, 1872, xxix, 29. Seats over 1,800.

1876-9 "rue des Tournelles; by Varcollier; B. J., 1879, xxxvii, 856; 858; 968. Seats 1,300.

1877 "rue Bonifaut; Spain and Portug.; by Leroy de Bonneville.

BRESTA, Brestis, or Brestzi, in Lithuania; one of the largest and most celebrated in Europe. 96.

CASSEL; by Rosengarten. ALLG. BAUZ., 1840, pl. 349-53.

LEGHORN; finest in Europe; BROCKEDON, *Italy*, 1842-3.

HEIDENHEIM (small); by Birklein, ALLG. BAUZ., 1854, pl. 656-8.

1826 MUNICH; by J. Métiévier.

1832 COPENHAGEN; by Hetsch, very fine.

1886 VERSAILLES. LYON; by A. Hirsch; DALY, 1865, xxii, pl. 43-8.

1850 BERLIN; by ...Titz: another 1855 by G. Stier; and a third 1863 by J. Knoblauch and F. Hollin, which surpasses in size, etc., those at Pest, Vienna, and Cologne. Published fol., Berlin, 1867.

That at STUTTGART is gorgeous; others at NUREMBERG, ROTTERDAM, HANOVER, WIESBADEN, HAMBURG, COLOGNE by Zwirner, and STOCKHOLM by Scholander.

1879 FLORENCE; by Falcini, Trexas, and Micheli; B. J., 1880, xxxviii, 632.

It is stated that the synagogues at Florence, Warsaw, Breslau, and Prag (where there are eight others), "are of cathedral dimensions and great architectural interest"; and that the church L'Annunziata at Genoa was formerly a synagogue.

CANINA, *Ricerche—de Arch. degli Antichi Giudei*, etc., fol., 1845.

1845. FINN, *History of the Jews in Spain and Portugal*, 8vo., 1841.

1841. CONDE, *Dominion of the Arabs in Spain*, 8vo., 1854.

WEALE, *Handbook to London*, 8vo., 1851, p. 531-7, describes the then existing Syn. and schools. FERGUSON, *Temples of the Jews and other Buildings in the Haram area at Jerusalem*, 4to., 1878.

PICCIOTTO, *Sketches of Anglo-Jewish History*, 8vo., 1875.

A. J. MYERS, *The Jewish Directory*, 8vo., 1874. JEWISH WORLD newspaper for May and June 1887. ANGLO-JEWISH HISTORICAL EXHIBITION, *Catalogue*, 1887.

SYNCHRONISM. Concurrence of events happening at the same time; i.e., unity of design, unity of country, and unity of period.

STYLE. It formed the subject of a prize essay at

the Royal Institute of British Architects, awarded 1843. DE CAUMONT, *Synchronism d'Arch. dans la France*, 8vo., 1840.

SYNETREE; SYNTRE. Old English for CENTRE. RAINE, p. 11, Contract for building Catterick church, Yorkshire. 17. 19.

SYNNADICUM MARMOR, also called Mygdonian, and Phrygium. This marble was found at Synnas or Synnada, in Phrygia, in the centre of the peninsula of Asia Minor. It was black and red, or a black ground with small circles. It is also considered to be the same as PAVONAZZO. Columns of Phrygian marble were used 699 in the basilica of Emilia Paulus at Rome. The celebrated villa of Gordian (235-7) on the road to Preneste had a portico of 200 columns of the four curious and costly sorts of marbles, of which the Synnadian was white mixed with oval spots of purple; GIBBON, *Decline*, 8vo., 1853, i, 223. In Sta. Sophia at Constantinople, this marble was used both of a rosy hue, one having a white shade, the other purple with silver flowers; *idem*, 1854, iv, 334. SIDONIUS APOLLINARIUS states that Phrygian marble was white; CLAUDIAN, as having red spots of a round or oval shape. Between Kosru Khan and Bulwudin, appeared extensive quarries from some of which was probably extracted the Phrygian marble, called Synnadicus or Docimitis, from the places where it was found. STRABO, 577, states it was taken to Italy; and Hadrian even placed columns of it in his new buildings at Athens, where fine marbles abound; PAUSANIAS, *Attica*, c. 18; LEAKE, *Asia Minor*, 8vo., 1824, p. 36. 2. 6.

SYPHON, and SIPHON. A bent tube having one leg shorter than the other. It acts from the pressure of the atmosphere being removed from the surface of a fluid, which enables it to rise above its common level. It is used for emptying liquors from casks, etc. On a large scale, the difficulty of exhausting the air out of it, has now been overcome by the power of the steam engine. The perpendicular height of the shorter leg must not be greater than the column of water capable of being raised by the pressure of the atmosphere. A simple method of making a syphon is detailed by BENNETT, in *MECHANICS' MAGAZINE*, 1823, p. 331-2. The principle was well known to the ancients, who employed it in aqueducts forming a syphon bridge or SOUTERAZI to convey water across a valley. The aqueduct, erected *cir.* 40 A.D. from mount Pila to Lyon has three large syphons; *Detached Essay*, Aqueduct, p. 13-4. A lead pipe 40 ft. long, of the Roman period was found at Arles; *Handbook*, France, 1852, p. 466. The aqueduct supplying water to Genoa, as at the valley of Cavarola, 215 ft. long, with 100 ft. of greatest height; the subterranean portion is made of cast-iron syphons; *Detached Essay*, Aqueduct, p. 12, fig. 12.

SYPHON; see WATER WASTE PREVENTER: see TRAP.

SYPHON SEWER AND CONDUIT. This term has been given to the form of conduit for passing a liquid under an obstruction so as to continue the conduit in a particular line; but as it is merely a tube or conduit somewhat depressed in its course, it scarcely deserves the name. Great objections were raised to several of the schemes for the drainage of the metropolis on account of the proposed syphons to pass dock entrances, etc. The experience of Mr. Lindley at HAMBURG proved the success of a syphon, where a dip occurs of 4 ft. 9 ins. by 5 ft. 3 ins., with a general fall of 1 in 3,000, it was about 4 ft. in its lowest part and extended for 200 ft. It was a very erroneous belief that sewers were choked up with soil from houses. Evidence before the Government referees; as condensed in *BUILDING NEWS Journal*, 1853, iv, 703. One of cast iron at Derby is described in *CIVIL ENGINEER, ETC., Journal*, 1844, vii, 261.

At Newport, Monmouthshire, during the construction of sewers, some became suddenly charged with water; the contractor to save pumping contrived a syphon by which the water was quickly drawn out from a depth of 20 ft. and discharged into a river about 300 ft. distant, at a trifling expense; *BUILDING NEWS Journal*, 26 Aug. 1859; *BUILDER Journal*, xvi, 573; *ILLUSTRATED LONDON NEWS*, 1843, ii, 92. After the bursting of the outfall sluice of the Middle Level in 1862, J. Hawk-

shaw, C.E., placed several syphons to draw off the water over the temporary dam.

SYRACUSE (Lat. Syracusa; It. Siracusa). A town and seaport on the south coast of Sicily; it now comprises only a small portion of the ancient city, the largest in Sicily, having quarters called Ortygia, Acradina, Tyche, and Neapolis, crowned by the strong fortress of Epipolæ, which formed a circuit of at least 22 miles. The castle is generally attributed to the Byzantine general Maniaces, but the great hall and portal are considered to be Norman work, by G. KNIGHT. Belisarius took Syracuse 534-6. After the Roman conquest, the city became restricted to Ortygia and the lower part of Acradina: all the upper city was abandoned in the time of Augustus (b.c. 31-A.D. 14). The Saracens (797-835) plundered it, and from that time Ortygia became the only part inhabited. The cathedral dedicated to Sta. Maria della Colonne occupies the ancient temple to Minerva, 185 ft. by 75 ft. on the outside; it has a range of Doric columns on its northern side, each having 20 flutes; those in the posticum and pronaos, which parts are supposed to be later, have bases; the ornaments were plundered by Verres (b.c. 73-1). The roof fell in 1100; GALLY KNIGHT, *Normans in Sicily*, 8vo., 1838, p. 133. The church of S. Filippo has a bath or well under it about 40 ft. deep, to which is a curious spiral staircase, the steps do not radiate. The chapel of the dead, *cir.* XVI cent., is given in HITTORFF, *Arch. Moderne de la Sicile*, fol., Paris, 1825, pl. 42. The small church of S. Giovanni, XII or XIII cent., is among the oldest Christian churches in Europe; *ARCHÆOLOGIA*, 1833, xxv, pl. 31, p. 279: it is now the entrance to the catacombs; SEROUX D'AGINCOURT (Architecture), pl. ix, No. 8. S. Martino has a Gothic façade with a doorway of four orders, the details being of a northern character; as are also those of S. Giovanni. The church of the collegio de' Gesuiti is spacious and of the Italian style. The Capuchin monastery of Palombino has the largest of the catacombs annexed to it. These quarries or *latomizæ* are excavations 60 to 80 ft. in depth, between the upper and lower towns; they were used as prisons, and are now occupied as gardens and orchards; in connection with them is the cavern called the "ear of Dionysius" (EAR); it is 64 feet high, 17 to 35 ft. wide, and 187 ft. deep; WILKINS, *Magna Græcia*, fol., 1807, pl. 10; BOLDETTI, *Cimet. SS. Martiri*, fol.; GOLDICUTT, *Antiq.*, fol., 1819. There are traces of several ancient streets.

Of the celebrated temple of Diana only vestiges remain. The Greek theatre (*cir.* 470 B.C.), hewn out of the rock, is the largest in all Sicily; it is about 116 ft. diam., and accommodated over 24,000 persons; there are no remains of the proscenium. The Roman amphitheatre was cleared out about 1840; it is a long ellipse, being 272.10 Sic. palms by 154, exceeding those of Verona, Otricoli, and Puzzuoli. (SERRADIFALCO; ESTRANGIN, *Etudes*, 8vo., Aix, 1838, note p. 23.) Near it are the ruins of the Ara, an altar erected by Hieron II, discovered 1839; it is 640 ft. long by 61 ft. broad, and partly cut in the rock and partly formed of rude masonry, molded, and raised on three steps, in parts stuccoed, and running due north and south. The palace of sixty beds, said to have been built by Agathocles (son of a potter and who seized Syracuse B.C. 317), has arches formed of terra-cotta tubes in form like long-necked bottles without a bottom, filled with mortar and fitted one into the other, the whole covered with a cement and flat bricks above. The aqueduct cut in the rock, was constructed by the Carthaginian prisoners, and was begun by Gelon (B.C. 491-478), and enlarged by his brother Hieron (B.C. 478-467); it brought water about nine miles from a place now called Bucemi, into five large reservoirs; one perhaps the smallest is still in good condition, 107 ft. by 40 ft. by 25 French ft. in depth, and vaulted in two ailes; *ATHENÆUM Journal*, 1855, p. 201. A reservoir partly formed called piscina di S. Nicolò; and a curious bath under the casa Bianca. On the Anapus and high up, is the fountain of Cyane, near Pisma, about 60 or 70 ft. diam., of pure water 26 ft. deep; the Cyperus Papyrus still floats there in abundance. In Ortygia is the fountain of the

nymph Arethusa, now only a pool of not very pure water, and used for washing linen. In 1854 was cleared out a Greek conduit passing under the bed of the Porto Grande, connecting the fountain with the long water-course on the heights of Epepoli; it is 25 ft. below the sea level, and about a mile long, about 6 ft. wide and 12 ft. high; (ATHENÆUM). Outside the walls are parts of the shafts of two fluted columns of the temple to Jupiter Olympius, enriched by Gelon, 6 ft. 6 ins. diam. and 21 ft. high, on masonry about 6 ft. high above the plain. There are several monastic establishments, a college, picture gallery, senate house, library and museum, and barracks. A COURT or quadrangle of a house in the via Amalitania is given in *Illustrations*, 1852, pt. iii, pl. 89, perhaps from the palazzo Bucceri (formerly Lanza), *cir.* 1350, showing an arcaded court; the pal. Arduzzoni Castellotti is another example; the pal. Terrisena is of later date; the pal. Montalto is the richest specimen of mediæval architecture and has a date of 1397.

Map No. 206 of the Society for the Diffusion of Useful Knowledge. CICERO in *Verrem*, act. 2, B. iv, c. 52-3. STRABO, B. 6, p. 415. MIRABELLA, *Pianta di Siracusa*, fol. 1613; and FAZELLO, *De Reb. Sic.*, 1749, are now of little use. CLUVERIUS, *Sicil.*, 1624, i, 12. AMICO, *Urbis Syra. Ant. Archæp.*, 1704; 1725; and works by AMICO e STABELLA, 1644, etc.; 1733. BONANNO, *Ant. Sir. illustrata*, 4to., Pal., 1624; 1717. D'ORVILLE, *Sicula*, fol. Amst., 1764, ii, 175-202. SWINBURNE, *Travels in the two Sicilies*, 4to., 1783-5. HOUËL, *Voy. Pitt. des isles de Sicile, etc.*, fol. 1782-7. DE NON, *Voy. Pitt. de Naples et de Sicile*, fol.; and 1788 transl. as *Travels in Sicily*, 8vo., 1789, p. 312.

LETRONNE, *Essai critique sur la Topog. de Syracuse, au com. du V siècle avant l'ère vulgaire*, 8vo., Paris, 1812; and in *Œuvres Choïsies*, 2nd ser., Geog. et Cosmog., 8vo., Paris, 1883, i, 17-76. CASSAS, BENCE ET LONDON, *Grandes Vues Pitt. de la Grèce, etc.*, fol., 1813. GOLDICUTT, *Ant. of Sicily*, fol., 1818, pl. 20-8. HOARE, *Classical Tour*, 8vo., 1819, ii, 140-76. HUGHES, *Travels in Sicily, etc.*, 4to., 1820, i, 38. LEAKE, *Morea*, 8vo., 1830, iii, 278; *Asia Minor*, 1824, 322-9. WOODS, *Letters*, 4to., 1828, ii, 317. STUART, *Antiq. of Athens*, Sup. vol., iv, fol., 1830. FASO PIETRASANTA, duca di Serradifalco, *Antichità della Sicilia*, fol., Pal., 1834-42; amphitheatre. LEAKE, *Notes on Syr.*, in ROYAL SOCIETY OF LITERATURE, *Transactions*, 2nd ser., iii, 239-354. ALLAN, *Pict. Tour in the Medit.*, fol., 1843. CAVALLARI, *Topogr. von Syrakus*, 8vo., Gott., 1845. BARTLETT, *Pictures from Sicily*, 8vo., 1853. ANGELL, *Some Account of the Ancient City*, in BUILDER *Journal*, 1847, v, 33-4. SMYTH, *Memoir descriptive of Sicily*, 1824. BEULÉ, in *DALY, Revue Générale*, 4to., 1857, xv, 183-90, gives the *Temples*. MURRAY, *Handbook*. BAEDER, *Guide*. 2. 14. 23. 25. 28. 50. 96. 107.

SYREN; see SIREN.

SYRIA; Canaan, Land of Israel in the north, Judea in the south, Palestine; Holy Land. The country which lies along the eastern shore of the Mediterranean, in Asiatic Turkey, extending from the border of Egypt and the peninsula of Sinai on the south, to the confines of Asia Minor on the north; on its eastern side is the desert plain of Arabia; it is about 360 miles long by 60 to 100 miles broad. "Art before the reign of Solomon; from Solomon to Herod; the period of Constantine; epoch of Justinian; of the Arabs from 636; and the dome of the Rock"; are described by PIEROTTI. The sultans of Egypt ruled the country till 1517, when it was taken by the Ottoman prince Selim I, since which it has been ruled by the Turks. ACRE. ALEPPO. DAMASCUS. JAFFA. JERUSALEM. NYMPHI. PETRA. SIDON. TYRE. PHENICIAN ART. 28. 50.

WRIGHT, *Early Travels in Pal.*, 700-1697, 8vo., London, 1848. WEBB, *Survey of Egypt and Syria, temp. Henry V.*, 4to., 1821. JOSEPHUS, edit. by Traill, 8vo., 1847-50. AMICO, *Piante di sacri edifici*, fol., 1609. GALLIPOLI, *Trattato de sacri Edifici di Terra Santa*, fol., 1620. SANDYS, *Travels in Greece, etc.*, fol., 1652. RELAND, *Pal.*, 4to., 1716. OCKLEY, *Conquest of Syria, etc., by the Saracens*, 8vo., 1708. CASSAS, *Voy. Pitt. de la Syrie*, fol., Paris (1798-9). FORBIN, *Voy. dans le Levant en 1817-8*, 8vo.

and fol., 1819. BUCKINGHAM, *Travels in Pal.*, 8vo., 1821. BURCKHARDT, *Travels in Syria*, 4to., 1822. IRBY AND MANGLES, *Travels, etc.*, 8vo., 1823; 1844. KITTOE, *Pict. Hist. of Pal.*, 12mo., 1827. ROBINSON, *Biblical Researches*, 8vo., 1837; 1856; 1867. G. REY, *Monuments de l'Arch. Ml. des Croisés en Syrie*, 4to., 1835. BARTLETT, *Syria*, 4to., 1836. TAYLOR ET REYBAUD, *La Syrie et l'Égypte*, 4to., Paris, 1838-9. LÉON DE LA BORDE, *Voy. en Orient*, fol., Paris, 1838. UNIVERS PITTORESQUE, *La Syrie Ancienne*, par YANOSKI, 8vo., 1848. ROBERTS AND CROLY, *Holy Land, etc.*, fol., 1842. GIRAULT DE PRANGEY, *Monuments Arabes*, fol., 1846. WILLIAMS, *The Holy City, etc.*, 8vo., 1845; 1849. LYNCH, *United States expedition to the Dead Sea*, 8vo., 1849; 1855; J. WILSON, *Lands of the Bible*, 1847. SAULCY, *Voy. autour de la mer morte*, 8vo., 1852-4. LEPSIUS, *Ethiopia and pen. of Sinai*, transl. by Horner, 8vo., 1853. STANLEY, *Sinai and Pal.*, 8vo., 1856; 1866. *Cities of Pal.*, 16mo., London (1856). JOANNE ET ISAMBERT, *Ann. descr. en l'Orient*, 12mo., 1861. DREW, *Scripture Lands*, 8vo., 1860; 1862; 1871. DE VOGUÉ, *Les Eglises de la Terre Sainte*, 4to., 1860. BOURASSÉ, *La Terre Sainte*, 8vo., 1861. PIEROTTI, *Architecture of Pal. from the earliest times to the crusades*, read at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1861-2; and BUILDER *Journal*, 1862, xx, 309-12. WIGLEY, *Mediæval Studies in Pal.*, B. J., 1863, xxi, 256. FERGUSSON, *Hist. of Architecture*, 8vo., 1865. DE VOGUE and WADDINGTON, *L'Arch. civile et relig. du I au VII siècle dans la Syrie centrale*, 4to., Paris, 1865-77. RITTER, *Palästina und Syrien*, and transl. by GAGE, 8vo., Edinb., 1866. PALESTINE EXPLORATION FUND; founded 1865; see BUILDER and BUILDING NEWS *Journals*, *passim*. TRISTRAM, *Land of Israel*, 8vo., 1865; 1876; and *Land of Moab*, 8vo., 1873. E. G. REY, *Les colonies franques de Syrie aux XII et XIII siècles*, 8vo., 1883. PERROT ET CHIZEP, *Hist. of Art in Phœnicia, etc.*, 8vo., 1885. *Churches of Palestine*, in *ECCLÉSIOLOGIST Journal*, 1846, vi, 134-41; 206-14; and vii, 91, 127, 209-15. FRESHFIELD, *Churches of Syria*, in *ARCHÆOLOGIA*, read 3rd April 1873, xlv, 392.

SYRICUM MARMOR. A name given by the ancients sometimes to a white, and sometimes to a yellowish marble; both used in the public buildings of the Romans, but seldom for statuary, it not being capable of a high polish.

Syricum; a colour used by the Romans; OSTRUM.

SYSTYLE. A Greek term (from *stulos*; and Lat. *systylos*) applied to a colonnade or portico where the pillars are closely placed being two diameters apart; yet not quite so close as in the pycnostyle system. If the height of the column of a portico were divided into nine and a half parts, one of the parts would be the diameter; VITRUVIUS, 3, ii. 7. 11.

SZARCO-SELO; see St. PETERSBURG.

SZEGEDIN. A town of Thither Theiss in Hungary, is divided into the town proper, the fortress, the upper and under suburbs, and the corn market. The Greek church is considered the most beautiful in Hungary. The parish church with a tower belongs to the Piarists, who have a college. The fortress is entered by two bridges, and has its own church and gaol. There is also a Minorite church and cloister; the church of S. Demeter; a Franciscan church and monastery; comitat house, town house with a tower, and large barracks. ALLGEMEINE BAUZEITUNG, 1875, pl. 34, gives a *wohnhaus* by J. Berg; and 1877, pl. 28, another by him. 26. 28. 50.

SZERELMEY (NICOLAUS CHARLES). In 1857 he took out letters patent for "rendering structures waterproof"; and wrote *Encaustic and Zopissa processes, etc.*, 8vo. (1861); which was commented upon by TITE, *Stone preservative processes*, at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 28 Jan.; 4 and 11 Feb. 1861. ZOPISSA.

SZULC (MICHAEL), practised in Poland from 1772 to 1812. SZUWALKACH, in Lithuania. The cathedral was designed *cir.* 1808-12 by P. Aigner.

THE DICTIONARY OF ARCHITECTURE.

TABB

TAA, or PAOU-TAA, hence pagoda. A temple which in China consists of porticoes, halls, and pavilions connected by galleries or corridors, the roofs have coloured glazed tiles, the angles being ornamented with dragons projecting forward and decorated. The temple belonging to the religion of Fo or Buddha has a lofty tower, generally of nine stories standing by itself; in the square lower story is a statue of the god, the walls, etc., being enriched with tile work, etc.; it is merely an exaggerated TEE of the Indian dagoba. In the south it generally has nine stories, but in the north it ranges from three to thirteen. It is easy to trace the *taa* or *tee* through all the stages of the change. In India, the single wooden *chattah* or umbrella of Karli becomes the nine-storied tower at Chittore, and then the transition is easy to the Chinese examples, although the elaboration of the two was simultaneous, and the Chinese had probably erected tall towers as early as the Jains. The pagoda at NANKIN, the Paou-gün-sze or "monument of Gratitude", erected 1412-31 (and destroyed 1853 or 1856) is one of the best known; it was later called Lew-le-paou-te or porcelain tower; the "second Bar" pagoda, on the Canton river, a "pillar of victory", is nearly the same. One in the summer palace at PEKIN has three or seven stories and is more diversified; the one at Tung Chow has thirteen stories appearing like string-courses; no windows are visible; FERGUSSON, *Indian Architecture*, 8vo., 1876, p. 120; 689, 252-3, 695-8. WRIGHT AND ALLOM, *China Illustrated*, 4to., London (1843), ii, 33, gives illustrations of a large number in that country. *Detached Essays*, Chinese Architecture, p. 11. The word "ta" was formerly given to the sepulchral tower, of massive but strange forms. 1.

In *Burmah*, the king's palace is like a seven-storied pagoda crowned with the pinnacle; its monasteries or *kioums* are of many stories with tall seven-storied spires, recalling the many-storied temples in Nepal which are in all essential respects nearly identical: FERGUSSON, 627, 629. In *Siam*, *cir.* 1350-1650, the older pagodas differ in many essential respects from those in India or in *Burmah*: the upper part has a rounded domical shape surmounting a circular upright part. The same outline is found in the crowning members of the pagodas of *Bangkok*; p. 633-6. In *Japan*, the torii or gateway in front of the Shintoo temples is also called *taa*.

TAB or EAR. The projection on each side of the band to hold a rain-water or other pipe in its place against a wall to which it is secured by spikes.

TABACCO (BERNARDO), is said by MILIZIA to have introduced the Borrominean style into Bassano; it was particularly used in altar-pieces; and was banished by G. MIAZZI. 3.

TABBY; see TAPIA.

ARCHITECTURAL PUBLICATION SOCIETY.

TABE

TABERN. A provincial term for a cellar.

1.

TABERNA. The "*tabernæ argentariæ*" or shops for the money-changers were found in the forum at Pompeii, wherein the pedestals of some of the tables still remain. At Rome, the "*tabernæ veteres*" were shops with a portico surmounted by galleries for viewing games, etc., in the forum, along the front of the basilica Julia; and a similar row of shops was placed in front of the basilica Æmilia. VITRUVIUS, v, 1. A cutler's shop is represented on a cippus in the Vatican. 1. 2. 25, 28.

TABERNACLE. The portable temple constructed by the Israelites in the wilderness. The temporary structure, a sort of tent, used by them for the performance of public worship previous to the erection of the temple at Jerusalem. It consisted of an open court containing within it a building to which the name of tabernacle was more properly applied and which was covered by ten curtains of various sizes and materials. This was 32 cubits or about 50 ft. long by 12 cubits or 19 ft. wide. The court was 100 cubits long by 50 cubits wide; it was surrounded by piers 10 cubits wide and 20 cubits high placed 5 cubits apart, covered with silver, standing on copper bases, and having curtains drawn between them secured by hooks. The entrance, 20 cubits wide, was at the east end, to which was a loose curtain.

The term has been applied to a modern building for public worship, as Whitfield's Tabernacle; Spurgeon's Tabernacle, etc.

TABERNACLE (Lat. *tabernaculum*, *custodia repositorium*, *sacrarium*, *ciborium*; Span. *custodia*; Fr. *custodia*, *tabernacle*; Ger. *sakramentshäus*, *gottesküttchen*, and *weihbrothgehaue*). The name for the special and elaborate receptacle for the consecrated host, or Blessed Sacrament, used in Roman Catholic churches, which on Good Friday is deposited in the sepulchre. It was introduced in the XIV century. *ÆDICULA*. *ADYTUM*. In *Holland*, *Italy*, and *Portugal*, the tabernacle was a cupboard in the wall; in *France* it was placed under a ciborium or dome; while in *England*, suspension was practised, as by a dove, covered by a canopy cloth of rich material. A standing tabernacle of metal on the altar also prevailed; it was adopted by cardinal Pole. In the XIII cent. an *arca* was used on the altar in some French churches; whilst in others, as in those of England, the aumbry (*armarium* or *sacrarium*) either behind or on one side of the altar. In *France*, part of the retable or reredos was formed into a ciborium; WALCOTT, in *BUILDING NEWS Journal*, 1873, xxiv, 549. It is generally of a rich metal highly decorated; and as a pix or pyx, or ciborium, was usually set upon the altar. At S. George's R. C. church, Southwark, it is of stone in the form of a huge tower, and stands on the altar occupying a large portion of it; *ECCLÉSIOLOGIST Journal*, 1849, ix, 159. It is often worked in stone, the larger ones free

standing, richly carved, pyramidal in form, and nearly always erected on the Gospel or north side of the choir or chancel. The passion of Christ is often depicted on them. The following is a list of good examples.

In *Spain*, the *custodia* are of silver and many executed by Henrique d'Arphe of Germany; as those at Leon, 10 ft. high; at Toledo, 9 ft. high, cost about £415; and at Cordoba. Those at Santiago, at church at Medina de Rioseco, and at cathedral at Leon, were by Antonio d'Arphe; all the above are now destroyed.

Juan Ruiz, a pupil of H. de Arfe, executed 1533-37 the Greco-Roman *custodia* in cathedral at Jaen, he also executed those at Baza and at the monastery of S. Pablo at Seville. Alonso, Francisco Beceril, and Cristobal, son of the latter, the great *custodia* at Cuenca cathedral 1528, used in 1546, completed 1573, cost 17,725½ ducats, now destroyed. These are all described; the verses by Juan d'Arphe, grandson of Henrique, descriptive of the use and origin of the *custodia*, are given in STIRLING, *Annals of Artists of Spain*, 8vo., London, 1818, i, 159-62. Another in the capilla mayor of the cathedral at Jaen, of marble and bronze, is a good work by J. P. Arnal, died 1805. Marchena, S. John's church, 1586 of silver gilt, by F. Alfaro, who was paid £1,400; and at Seville cathedral, for great altar, magnificently silver gilt.

XIII cent., at Pingpuncut, in Majorca, richly laboured and remarkable. 50.

Scotland, stone tabernacles of the XVI cent., with sculpture, are still preserved at Deskford and Pluscadine; others at Kintore and at Kenkell, both in Aberdeenshire, are shown in LEE, *Glossary*, 4to., London, 1877. Tabernacles are placed upon altars generally in the Scottish (Episcopal) church.

In *Frankonian* churches, at Heidingsfeldt, Ochsenfurth, of stone, above 40 ft. high, Kitzingen, and pilgrimage church at Volkach, are given by BREWER, in *BUILDER Journal*, 1866, xxiv, 687.

- xc c. Caudebec; church of Ste. Gertrude; MOYEN AGE MONUMENTALE, No. 18 (or ii, pl. 75).
- xc c. Semur; cathedral; Ditto, No. 23 (or ii, pl. 76).
- cir. 1400. Hal; church of Our Lady and S. Martin; a fine one erected against a buttress.
- end xv c. Courtrai; church of S. Martin; 22 ft. high of brown stone.
- 1614. Dixmude; in church of the Virgin and S. Nicholas; of coloured marbles, with many statues, given by the magistrates.
- xv c. Ghel; church of S. Dymphna; restored.
- cir. 1550. Léau; church of S. Leonard; of alabaster, good Renaissance, with lofty canopy, nearly 90 ft. high, with sculpture; rich brass railing with bowls and prickets. Near is the tomb of the donor sir Martin van Wilre, lord of Oplinter, 1558. WAUTERS, *Belgique*, 8vo.
- 1520. Limburg; church of S. George; handsome, with statues. Feul; church, with an iron door of XIII century (?).
- 1578. Lovers; church; Renaissance, with statues and sculpture.
- xiv c. Cologne cathedral, in Sacristy; lofty, of beautiful design.
- " church of S. Maria im Capitol; a mural tabernacle.
- xiv c. end. — S. Cuzibert church; on south side, with sculptures and paintings of saints and angels.
- xv c. Bruges; church of hospital of S. John; a rich stone one with brass doors, and a pelican in her piety wrought above.
- 1450. Louvain; collegiate church of S. Peter; hexagonal, about 46 ft. high, with sculptures by M. de Layens; fine brass doors. Cologne; S. Gereon; rich Renaissance work. Bonn minster; of late date. Remagen; church of SS. Peter and Paul; very beautiful. Muenster Maifeld or Meiland (?). Stone, good; east of north aisle. Oberwesel; S. Martin; north of the altar; octagonal and very fair.
- Frankfurt-on-the-Main; minster; below it is a stone figure of a subdeacon holding a book-rest, for the gospel.
- Kitzingen; north of chancel-arch; good.
- Nuernberg; S. Sebaldus; most elaborate, but somewhat stiff, with figures of S. Peter and S. Sebald.
- 1415-50 } — S. Lorenz; by A. Kraft; most delicately carved in stone, tapering 64 ft. in height in intricate open work; supported by the figures of the carver and his two pupils. A cast is in the South Kensington museum. MOYEN AGE MONUMENTALE, pl. No. 29 (or iv, 58). KRAFT.

Esslingen; Dionysiuskirche; one of most minute and delicate sculpture.

1469. Ulm; minster; the great one, 90 ft. high; a smaller one south of the high altar with an iron door exquisitely wrought. Rome; S. Clemente; over a side-table on south side is a niched ambry or tabernacle, a pointed insertion.

— S. Croce in Gerusalemme; at east end of apse; of stone, inscribed "Hic Domus adora".

Noerdlingen, 50 or 60 ft. high, by Weyerer and Critz. Regensburg, 52 ft. high.

xiv c. Heiligenblut, in Austria; with statues 28 ft. high. Kaschau, in Hungary; S. Elizabeth church.

1510. In cathedral des Bisthums Lebuszu Fürstenwalde; KALLENBACH, *Deutsch-mittel-buch*, fol., Munich, 1847, pl. 80.

WANDERER, *Adam Kraft*, etc., 1490-1507, fol., Nur., 1869, gives those at Nuremberg, Heilsbronn, Schwabach, Kalchreuth, Katzwang, Fürth, and Ottensoos. WEALE, *Handbook to Belgium*, etc., 8vo., 1859. WEBB, *Continental Ecclesiology*, 8vo., 1848, s. v. Index. VIOLLET-LE-DUC, *Dict.*, art. Autel, 8vo., 1867; and *Mobilier Français*, 8vo., 1858. DUNN, *Notes and Sketches*, 4to., 1886. KING, *Orfèverie*, fol., 1854, ii, pl. 89-91. BARBIER DE MONTAULT, *Const. de l'aménagement—des Eglises*, etc., Paris. MARTINUCCI, *Sacramentum Sacremoniarum*, Rome, 1871. BRIDGETT, *Hist. of the Holy Eucharist in Great Britain*, 1881. 25.

TABERNACLE WITH ALTAR.

1348-59. Florence; church Or S. Michele, by Andrea (Orgagna) di Cione; white marble. GAILHARAUD, *Monuments*, 4to., Paris, 1850, iii, 8 plates.

xiv c. Rome; church of S. Giovanni Laterano; MOYEN AGE MONUMENTALE, pl. No. 185 (or iii, 100).

— church of S. Lorenzo fuori le mura; SEROUX D'AGINCOURT, *History of Architecture*, pl. 28, No. 37; of marble; the four columns are of red porphyry.

TABERNACLE. A general term formerly applied to a canopied stall, or niche for the reception of an image (MEASON; HOVEL; HOUSING; are other terms used); a cabinet or shrine; ornamented open work; an arched canopy over a tomb; etc. Such a work, as a pinnacle or canopy, is shown in GWILT, *Encyc.*, edit. 1876, p. 933, and 1888, p. 975, from MÖLLER, *Denkmaler*, fol., 1821. WARTON, *Essay*; LYDGATE, *Troy*, c. xxviii; CHAUCER. 1. 2. 16. 17.

TABERNACLE FRAME. "The tabernacle frame, almost the only species of ornament (in an apartment) formerly known in this country, now universally exploded." It is explained as "a collective term, made use of by English artists to express the whole dressing of a door, window, niche, or chimney, when the dressing consists of columns or pilasters, with an entablature and pediment over them", etc.; ADAM, *Works in Architecture*, fol., 1773, i, p. 4-5. NICHE.

TABERNACLE WORK, or SHRINE WORK. Any delicately sculptured tracery, or open work, similar to that of the upper part of a tabernacle. NICHE. FILIGRANE. HABENRIES. The plain niches of the XIII cent., early in the XIV became gorgeous tabernacles, in which as much architectural skill and industry was often bestowed as in building a whole church; they were filled with statuary, etc.; MILNER, *Treatise*, 8vo., 1835, p. 106. RICKMAN, *Attempt*, 8vo., edit. 1848, p. 53. At Ely; the walls of the chapel of bishop West (1515-34), are panelled with tabernacle work, and were crowded with figures though not to such an extent as bishop Alcock's; KING, *Ely Cathedral*, 8vo., 1862, p. 213.

TABLE. Any broad slab (technically SEAL or table; ECCLESIOLOGIST *Journal*, 1844, iii, 6). At the era of the reformation it meant the slab only, "a decent table standing on a frame"; articles of queen Elizabeth, 1564, in bishop Sparrow's Collection, 1684, p. 125; GLOSSARY OF ARCHITECTURE. 6 June 45 Edward III; To Peter Maceon of Nottingham, by a tally to be paid him in discharge of 300 marks the said king owed for a table of alabaster made by him and placed upon the high altar within the free chapel of S. George at Windsor, £33 6s. 8d.; DEVON, *Issues*, 4to., 1837, p. 193: DEVON, *Issues* (Brantingham roll), 4to., 1835, p. xlii and xliv,

gives two other entries in 41 and 45 Edward III. "In Hereford they have turned the table in the cathedral and taken away the cups and basins and all such things, February 17, 1641"; CAMDEN SOCIETY, *Lady Brill. Harley*, 4to, 1854, p. 148.

In ancient Rome, PLINY states that tables of the "bruscum" and "moluscum" were in great demand, that from 6,000 to 10,000 sesterces were frequently given for one of a moderate size. It is supposed they were of remarkably spotted or variegated woods. A table in the Tudor period was usually called a "boarde" and was not in any great variety; thus in 1451 the parlour of the master's lodge at King's College, had a table with a pair of trestles; a folding trestle for a table standing by the chimney, and others down to 1560; in 1598 is mentioned a fair long table of wainscott; 1633 a round table; 1605 a joined table with two leaves; 1688 four Spanish tables; with others, the tables being no longer supported on trestles; WILLIS AND CLARK, *Arch. Hist. of Cambridge University*, 4to., 1886, iii, 351-3; 382-4. Later the massive legs and framework were richly carved. They were often covered by elaborate embroidered cloths, Turkey carpets, and tapestry work; HUNT, *Tudor Arch.*, 4to., London, 1830. TURNER AND PARKER, *Dom. Arch.*, 8vo., Oxford, 1851-59. Modern tables are of several distinct sorts, each of which has its own particular character. The dining-table, which is usually a parallelogram, and also circular, is made of great strength, and constructed to be lengthened or decreased at pleasure to suit the number of persons. There is also the drawing-room table, of a lighter and more ornamental character, usually circular or polygonal; the sofa table; occasional library table; pier table; and others, each partaking of the character of the apartment and of its purpose.

The marble table shown in *Illustrations*, 1849-50, Furniture, plate xxxiv (pl 147), is a genuine relic of the taste prevalent under the Norman rule in Italy.

A flat surface generally charged with some ornamental figure. The outline is generally rectangular, and when raised from the naked surface of the wall is called a *projecting* or *raised table*. When not perpendicular to the horizon, it is called a *raking table*. When the surface is rough, frosted, or vermiculated, from being broken with the hammer, it is called a *rusticked table*.

S. J. B.

TABLE. In perspective, the same as the plane of the picture, being the paper or canvas on which a perspective drawing is made, and usually perpendicular to the horizon. In the theory of perspective, it is supposed to be transparent for simplifying the theory.

S. J. B. 1.

TABLE. In wainscoting a low room, where there is no base or subbase... the outer edges of the stiles and rails may have a small molding; and also the outer edges of the panel may be bevelled away, and a *table* be left in the middle of the panel; MOXON, *Mechanick Exercises* (Joinery), 8vo., 1678, p. 106.

TABLE. It appears to have been the general term for any horizontal member in mediæval architecture; such as "bench table", "ground table", "scutable", "earth table", "ledgement or ligement table", "corbel table", "crest table", "skew table", "water table", etc.; WILLIS, *Nomenclature*. "Chamfered table" as to a buttress and wall, is used; as also "spire table" for its junction with the tower; as in BRANDON, *Analysis*, 4to., 1849, i, 55, 57.

16. 25.

The double flange of T-iron is called a table.

TABLEMENT. In old documents, is used to designate any flat surface or smooth course of architectural workmanship; also called **TABLE**.

16. 19.

TABLE OF GLASS. "A broad piece near a yard", HOLMES, *Accidence*, fol., Chester, 1688. It is 5 feet. Forty-five tables make a "case"; but of Newcastle and Normandy glass 25 tables make a case. SALMON, *Palladio Londinensis*, 8vo., 1755, p. 40. A circular plate of blown, or as generally called crown, glass before it is divided into squares. Twenty-four tables make a crate; "sheet" glass now takes its place.

S. J. B.

TABLE STONE. A flat stone comprised in the *Dol*, table

and *men*, stone (DOLMEN); also called *ladre*, from *lach* or *lich*, flat or table stone; LABORDE, *Monumens*, i, pl. 6 or 8, Carnac.

TABLET. A flat piece of marble, etc., more or less carved and fixed in an upright position, and on which is cut an inscription as a sepulchral memorial.

A term used by RICKMAN, *Attempt*, for mouldings or strings, such as the cornice and drip-stone.

TABLEWISE. In 1113, the churche be made of cunly stoone work tablewyse; S. Bartholomew the great, Smithfield; ancient MS. in BRIT. MUS., *Cotton. Vesp.*, b. ix. MALCOLM, *London. Redivivum*, 4to., 1803-7, p. 268. CLARKE, *Eccles. Lond.*, fol., 1820, pref. iv.

TABLING. The coping to a gable. The first piece of the tabling is worked in the solid of the SUMMER or SOMER STONE and so becomes an abutment and support to the upper portion. It is 3 ins. thick by 9 ins. wide when the *barge* or upper stones are 4 ins. thick, which leaves about 2½ ins. to project on either side. The inclined plane of the gable is called the "barge". In walls where large stones are not used their place is supplied by a "barge rafter", and this supports the outward course of tile called the "barge course"; WOOD, *Cottages*, 8vo., 1788, p. 9. "Tabill stane of the gavillis", 1554; SPALDING CLUB, *Aberdeen Burgh Records*, 4to., 1844-48, i, 281-2. **BARGE.**

TABLING; also called **HOUSING.** In scarfing timber, the ends of the pieces should be connected by indentations so as to resist a longitudinal strain. A single "table" or resisting abutment is both stronger and easier to form than two or four.

2.

TABLINUM. An apartment in a Roman house, often placed opposite the entrance, where it is so found in the House of the Nereids, at Pompeii, and where it does not communicate with the peristyle or other apartment, except the atrium. It is paved with opus signinum and mosaic bands; the walls nearly covered with pictures, with a frieze above having pictures and stuccoes intermingled as at the baths of Titus at Rome. VITRUVIUS, vi, 4, gives directions for its size. It is often a sort of square recess or intervening passage separated from the *cavædium* by an auleum or curtain, and in general having a window occupying the whole of one side.

25.

TABRIZ MARBLE. It is a white, diaphanous petrification found in large blocks in great quantities on the borders of lake Shahee, and used for baths, wall linings, tombstones, sculpture, etc., at Ispahan and elsewhere.

TABULA. This word may once have meant a niche or cupboard; as explained in *ECCLESIOLOGIST Journal*, 1847, viii, 95.

TABULACIO. A mediæval term for the coping of a wall. SURTEES SOCIETY, *Finchale Priory*, 8vo., London, 1837, p. 450.

TABULARIUM. The public record office in ancient Rome. The whole modern (from XIII cent.) palace of the senator rests upon the ancient foundations of the Tabularium founded B.C. 78 by Q. Lutatius Catulus; this substruction was a great and very difficult work. A corridor about 220 ft. long runs along the massive wall about 50 ft. high, of peperino, in which are concealed the buttresses helping to sustain the enormous weight of masonry over it; a flight of well-preserved steps, discovered 1840, leads down to this corridor; also two others, one leading up to the second story, the other down to the Forum at the spot where the temple of Vespasian was afterwards built; its flat arches are of interest. Over the corridor is a portico having Doric pillars (of travertine), which present a rare, if not unique instance of the imitation of the Greek art in that city under the Republic. The flat arch of vast span over the side entrance leading to this portico deserves attention, it still supports its immense burden, some broken stones having been replaced. BRAUN, *Ruins of Rome*, 8vo., Bruns., 1854, p. 14. WEY, *Rome*, 4to., London, 1872, p. 173. BURN, *Rome*, 4to., 1871, p. 97-8.

TABULAR PIPE. A pipe used in a heating apparatus, and having a flat top. *Detached Essay*, Heat, p. 13.

TABULATUM. A term used by the Romans to floors, panelling, ceilings, etc., of timber, as well as to balconies and

other projecting parts, which latter VITRUVIUS calls *projectiones*. The word "tabulation" was used in the eighteenth century by English writers to signify flooring or boarding. 1. 2. 4. 16. 25.

TAC (JAN), 1434, succeeded P. Appelman at the cathedral of Notre Dame at Antwerp, where he worked till 1449 and was succeeded by magister Everard.

TACCA (FERDINANDO), designed 1650-52 the original timber theatre at Florence, called La Pergola; rebuilt 1738-40 by A. (Galli) Bibiena; it was restored about 1860 and rendered one of the finest in Italy. 28. 68.

TACK. A small flat-headed nail, made of iron, tinned iron, or copper; the smallest to fasten paper to wood; others for carpets, linoleum, or for stretching canvas and cloth. They run from about 2½, 5, 6, 8, 9, 14, and 15 ounces per thousand. In the Statute, 12 Charles II, c. 4, 1660, occurs, "Tackes of iron the thousand vjs. viiij."; *Statutes at large*, fol., 1819, v, 197. "Soldered tackes" are tinned iron nails used to hold down a zinc, lead, or copper flat or cheek, and are soldered over. 4.

TACK. The technical term in Scotland for a lease, whether of lands or edifices; the rent is called the tack duty, and the tenant the tacksman. 14.

TACKLE. In the contracts, about May 1512, for the building of King's College chapel, Cambridge, it is stipulated that the contractors are to supply "lyme, sand, scaffolding, cinctores (cynctours), moldes, ordynances, and enery other thyng concerning the same vawtyng, as well workmen and laborers as all maner stuff and ordnaunces": also "vse of certeyn stuffes and necessaryes there as gynnes, whiles, cables, rolynettes, sawes, and such other as shalbe delynered vnto them by indenture." BRITTON, *Antiquities*, 4to., 1807, i, 13, 14; revised from WILLIS AND CLARK, *Arch. History*, 4to., Cambridge, 1886, i, p. 608. The term now includes all pulleys, screwjacks, crabs for hoisting, and all other aids to manual labour in the erection of a building. W. P. S. J. B.

It has been supposed that the word is obtained from "teagle".

TACKT I KESRA; see TAK KESRA.

TADCASTER STONE. A white magnesian limestone. Thfedale or Thevesdale quarry, also called Jackdaw Crag and Petres Post, about 1½ mile south-west of Tadcaster, in the lordship of Heselwode, Yorkshire. A quarry had been granted by king Henry VI on 4 March 1446 for King's College chapel, Cambridge, and obtained from Henry Vavasour, together with the right of carriage over his estate to the river Wharfe, so that the stone could be conveyed by water to Cambridge. The supply was continued for about three years, when 25 Feb. 1449 it was obtained from Huddleston. It was used for the plinth and basement molds and other portions; WILLIS AND CLARK, *Arch. History of Cambridge*, 4to., London, 1886, i, p. 486-7; 466, 575. In 1400 it supplied the stone for York minster; BROWNE, *York Cathedral*, 4to., London, 1847, p. 13, 47-8. SURTEES SOCIETY, *Fabric Rolls*, 8vo., Durham, 1859, *passim*. PHILLIPS, *Yorkshire*, p. 83. The restoration after the fire in 1829 was done in the same stone, and that of the exterior of the south transept under G. E. Street, R.A., in 1878, has been executed in this limestone from the Jackdaw Crag quarries.

TADDI (BURGUNDIUS), in 1300, added the marble seat and steps round the exterior of the cathedral at Pisa, according to an inscription "Borghogno di Tado operario dell' opera", given in TAYLOR AND CRESY, *Pisa*, fol., London, 1829, p. 22; from MARTINI, *Theatrum Basil. Pisane*, fol., Rome, 1705, p. 14, etc. Another one 1311 refers to the "pergamo" or octangular pulpit on the north side of the choir, removed by Ceoli after the fire.

TADMOR; The Hebrew. The city of Palms. See PALMYRA.

TADOLINI (FRANCESCO), born 1723 at Bologna, was first a pupil of D. Civoli, and then of C. F. Doti or Dotti. He rebuilt 1760, the palazzo Malvasia, later Manzoli, via S. Donato; designed the façade to the church of the Celestines with the sacristy and cloister; 1771, the pal. Stella, later Levi, near the old dogana; the pal. Gnudi, later Trivelli Spalletti di Reggio,

on the canale di Reno; the old building for the hot-houses in the botanical gardens, in strada S. Stefano; 1772, the fine portico of the *seminario arcivescovale*; some difficult works to the façade of the duomo; the pal. Aldovrandi, later Mazzacurati, at the villa di Camaldoli; the pal. Zagnoni, later Spada; the pal. Malvezzi Leone; 1800, modernised the church of Sta. Maria delle Laudi, or Compagnia dei Poveri (which had been rebuilt 1583-1603 by Dom. Tibaldi); and at Faenza, designed the great church of the Dominicans. He died in 1805 aged 82. His brother Petronio was a sculptor. MILIZIA, *Vite*, in *Opere*, 8vo., Bologna, 1827, v, 483. MASINI, *Dell' Arti*, etc., 8vo., Bol., 1862. 94. 105.

TAENIA or TINÆA. The fillet which in the Greek Doric order separates the frieze from the architrave. BAND. CAPITAL. QUADRA.

TAFI or TAFFI (ANDREA), born 1213 at Florence appears to have been the first to introduce among his countrymen the art of mosaic work. Hearing of the Greek artists at work in Venice, he went there and studied under Apollonius, whom he persuaded to return with him, and they executed several works; as described in VASARI, *Lives*. He died 1294 in Florence, aged 81. 68.

TAGLIACCOZZO CANALE (NICOLA), at Naples, repaired the church of S. Agrippino after 1615, and built the nave of that of S. Maria del Carmine. 95.

TAGLIAFICO (ANDREA), of Genoa, designed in that city the octagon vestibule, sala, etc. (after a design by de Wailly of Paris), at the palazzo Serra (by G. Alessi) in the via Nuovo (restored 1786 by G. Pellegrini; GAUTHIER, *Genoa*, fol., Paris, 1830, i, pl. 69-70); the sala in pal. Durazzo, in Al Zerbino; the white marble staircase and additions at the palazzo Durazzo, strada Balbi, designed by B. Bianco (i, pl. 12-15); casino in the Durazzo gardens, piazza Dinegro (ii, pl. 7); the palazzo Serra à Cornegiano (ii, pl. 18-21); villa Doria a San Pier d'Arena (ii, pl. 36-8); and villa du Scoglietto for the Durazzi near S. Pier d'Arena (ii, pl. 45). *Manuale di Genova*, 12mo., Genoa, 1846, p. 318, 365, 376. 68.

TAGLIAPIETRA (GIACOMO, and PAOLO his son, and AMBROGIO), are mentioned in VEDRIANI, *Pitt.*, etc., *Modonesi*, 4to., Modona, 1662, p. 61-2, the latter with the date of 1549. TAJAPIETRA. 68.

TAL. The Chinese tower or platform for astronomical or other purposes; or for enjoying the air and landscape. TAA. 1.

TAIA (ARDUIN), appears to be an error for TAJAPIETRA.

TAIL. The hold of any bearing piece on a support; as where a timber lies or tails upon a wall. HOUSING. The tail of a slate or tile is the lower end. DOVE TAIL. SWALLOW TAIL. 1.

TAIL BAY. See CASE BAY.

TAIL IN; TO. To fasten anything into a wall at one end.

TAILING. That part of a stone or brick which is inserted in a wall, as a stone step of a staircase, which may have a "tailing" of 6 or 9 ins. to support it. 1. 2.

TAILLOIR. The French term for the ABACUS of a capital of a shaft. 25.

TAIL TRIMMER. A trimmer next the wall, into which the ends of the joists are secured in order to avoid any flues. 1. 2.

TAINTON or TAYNTON STONE; see TEYNTON STONE.

TAJAPIETRA, tajapiera, tajapetra, and tagliapetra. In early times stonecutters and sculptors, and sometimes also architects, constituted but one class or guild; the "tagliapetra" college at Venice, comprised the two former so late as 1723, when they were separated through the agency of Antonio Coradini. TAGLIAPIETRA.

TAJAPIETRA (ANDRIOLO), "latomus", of Venice, 1376, built the cappella di S. Felice, in basilica of S. Antonio, at Padua, for Bonifazio de' Lupi, marchese di Soragna. Inscription in GUARDI, *Memoria de' Belle Arte*, 6 series, Bologna, 1846. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 119.

TAJAPIETRA (ARDUINUS), "fecit 1340", is inscribed on a

piece of sculpture in the atrio del Carmine, at Venice. He is said to have been the architect of S. Petronio, at Bologna. CICONARA, *Scultura*, fol. 1813, i, 321, 364, 425.

TAJAPIETRA (BORTOLO), "di 9 gennaio 1439 et subito fu compida, la qual porta fu lavorada de man di maestro B. T. da S. Maria dell'Orto"; and on the architrave of the door at the ducal palace at Venice is the inscription "Opus Bartolommei" (BON understood?); SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 136. For this family of BON, see BUONO (B.), and the ROY. INST. OF BRIT. ARCHITECTS, *Proceedings*, 1886, p. 61-2; 122.

TAKHT-I-SULEIMAN. A modern town perhaps occupying the site of the northern ECBATANA. MEDIAN ARCHITECTURE.

TAK-KESRA or TAUKE-KESRA. A celebrated ruin at CTESIPHON. MODAIN. SASSANIAN ARCHITECTURE. OVAL PARABOLIC ARCH.

TAKUNI (HIDANO), of the IX century in Japan, laid down the laws, handed down by tradition, which have regulated Japanese architecture to the present day; the old buildings have been rebuilt in exactly the same form, dimensions, and details. He showed how to prevent pagodas from being blown down; as explained in CONDER, *Japanese Architecture*, in ROYAL INST. OF BRIT. ARCHITECTS, *Proceedings*, 1885-86, p. 253.

TALAO. The name for a TANK in India.

TALAR. A platform, as supposed on the roof of the temples at Persepolis, and as shown in the rock-cut tomb of Darius, at Naksh i Rostam, in FERGUSSON, *Illustrated Handbook*, 8vo., 1855, i, 193-4; 196.

TALC (LAPIS SPECULARIS; PHENGITES). A species of fossil, in which silicate of magnesia predominates, composed of lamina, more or less flexible, transparent, soft, and easily cut, and stands heat, hence it is used for a cover to a gas light, to protect flames, and for a lantern. It is found in England, Spain, Norway, Hungary, Bohemia, and parts of Asia; in Cyprus; Russia; in the Alps and other mountains in Germany. On monte Scaglioso, near Gravina, it is found so long and transparent that it is used in the neighbouring villages as a substitute for glass. PLINY, *N. H.*, xxxvi, 22 (45, 46). *South Italy*, 1853, p. 466. 6.

TALENTI (FRANCESCO) of Florence, 1325-7 worked at the duomo of Orvieto, as one of the sculptors and stonemasons who received five soldi per day, the remuneration given to the masters. MARCHESE, *Lives*, 8vo., Dublin, 1852, i, 88. DELLA VALLE, *Orvieto*, 4to., Rome, 1791, p. 271. 68.

TALENTI (FRANCESCO). The architect of the church of Sta. Maria del Fiore, at Florence, is now considered to have been "neither Arnolfo nor Brunellesco, but the council of the workmen and citizens of Florence." It was not far advanced on May 29, 1355, when the books of the "Opera" record the decision that Talenti should make a model in wood to show how the chapels at the rear should be disposed correct, etc. On June 19, 1357, the foundations were begun of a new church, the church of Talenti and of Brunelleschi, the actual Sta. Maria del Fiore; CAVALLUCCI, *Storia Documentata*. A council held June 19, 1357 appointed Talenti *capo maestro*, and decided on the proportions and that the arches on each side of the nave should be three, then to four. Every step was the occasion for a contest and a competition. In 1376 the fourth and last of the great arches was completed; then a commission of thirteen master-builders and eleven painters was formed to make a design or model of the church; three were made. In 1407 the central tribune with its five chapels was finished, and in 1421 the armatures of the last tribune were taken down. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Proceedings*, 26 May 1887, p. 345-7; reprinted from THE TIMES Newspaper of May 12.

A master GIOVANNI TALENTI was employed as a mason at the building of the library of Sta. Maria Novella, at Florence, perhaps a brother or nephew of Jacopo. MARCHESE, i, 89, note.

TALENTI (fra JACOPO), of Nipozzano, in Fiesole, took the habit of the Dominicans after 1307. The necrology of Sta. Maria Novella describes him as "magister lapidum"; he is presumed to have studied or perfected himself under fra Giovanni

Brachetti da Campi, who succeeded fra Sisto and fra Ristoro, and from whose designs the campanile was completed about 1330, by da Campi and Talenti; they 1334 completed the great chapel of S. Niccolo and the sacristy adjoining; these works were presided over by fra O. Rustici; the two lay brothers fra Lapo Bruschi and fra Francesco da Carmignano were employed by Talenti as his head masons. On the death 1339 of G. da Campi, the whole of the works were confided to Talenti, who was remarkable for the celerity with which he conducted his buildings. He began the noble sacristy completed 1350 (door by F. Boschi) and used by the Cavalcanti as a chapel; about 1350 to 1353 the refectory (sometimes dated 1460); these two works with the great chapel of S. Niccolo may be regarded as his most perfect works in this church, which is usually stated to have been completed in 1357, and consecrated in 1420 (WEBB, p. 324). In 1357-9 he erected the vaults of the ancient hospice, now used as a refectory; in 1360 he continued the dormitory, labouring incessantly at the pavement, and long before this had completed the library and chapel of S. Antonio abbot. He twice restored the belfry which had been twice struck by lightning. The sculpture and tracery, the capitals of the pillars, the door and window ornaments, the (destroyed) screen or division across the church, and the old chapter-house, are also attributed to him. He likewise executed works in Florence for the Republic, and private citizens. CICONARA, *Scultura*, v. 3: lib. 3; c. i, p. 45; i, 431. He died during the pestilence Oct. 2, 1362 (with twenty-seven others of the monastery) at a great age. MARCHESE, *Lives*, 8vo., Dublin, 1852, i, 29, 34, 87-8, 90, 103-4, 107-10. WEBB, *Cont. Ecclesiology*, 8vo., 1848, p. 316, 324, 327. 68.

TALL-BOY. The name given to a tall flue of metal or clay ware, fixed on the top of a chimney to give a quicker draught to the smoke.

TALLIATOR. In the middle ages, a workman connected with stone-cutting; see QUADRATOR. INTAILER, entayler, intail-yng; ENTAIL.

TALLUT. A term in use in 1635 in Worcestershire for a hayloft.

TALLY SLATE. The name given to the "Green Tally slates" from the Eureka quarry, to distinguish them as being sold at per thousand from Westmoreland slates which are sold by the ton.

TALMAN (WILLIAM), a native of West Lavington, Wilts., where he had an estate (WALPOLE, but query). In 1671, he designed old Thorsby house, Nottinghamshire, for the duke of Kingston (burnt before 1762). CAMPBELL, *Vitruvius Britannicus*, fol., London, 1715, i, pl. 90-1. He 1681 designed Chatsworth, Derbyshire, for William Cavendish, first duke (then earl) of Devonshire, replacing by degrees the old house. The book of accounts shows that the south front was begun 12 April 1687; the hall and staircase covered April 1690; in May 1692 the works were surveyed by sir C. Wren; 1693 the east front, etc., finished 1700, when the west front was begun and finished 1706; in 1704 the old north front was pulled down and the whole completed. It is about 190 ft. square: CAMPBELL, 1715, i, pl. 72-76. LYSONS, *Magna Britt.* (Derbyshire), 4to., 1817, p. 150. NEALE, *Seats, etc.*, 4to., 1822, i. PENNY MAGAZINE, 1839, viii, 349. UNIVERSAL MAGAZINE, 1748, iii, 193. The bridge is by J. Paine; and additions by others. In 1698 he began Dynham or Denham house, Gloucestershire, for secretary Blaythwait; CAMPBELL, 1725, ii, pl. 35: and 1698 Swallowfield, Berkshire, for Henry, earl of Clarendon. In 1694 he held the appointment of comptroller in the king's board of works; and had the charge of the erection of Hampton Court palace under sir C. Wren; his report on the works, dated Sept. 12, 1699, shows what were then in hand; Crofton Croker's MSS. in the British Museum, Add. MSS. 20,101, p. 69, extracted in BUILDER Journal, 1849, vii, 327. As sir J. Vanbrugh was comptroller in 1702, Talman may have died about 1700.

A "Talman collection" was sold shortly before 1766 in Covent

Garden (GWYNN, *London Improved*, 4to., 1766, p. 43), and deposited in Eton college library (RIOU, *The Grecian Orders*, fol., 1768, p. 57). At the Royal Institute of British Architects is a folio volume of Talman's drawings containing a plan "designed for ye Ld. Carlisle"; a "house for lord Devonshire at Laub's Conduit Fields"; a plan for "ye D: of Leeds at Keiton in Yorkshire"; plans of a mansion "made by direction of king William"; "plans for sir John Woodthurst at Kimberly in Norfolk"; and a plan of an estate with two houses, with a complete design for the smaller one upon it. No biography has been found later than the notes of WALPOLE, *Anecdotes*, etc., wherein a slight portrait is given in late editions: and he appears in a print with sir Ralph Cole and Marco Ricci, in lord Orford's *Painters*. 3. 53.

JOHN TALMAN, his son, travelled to Rome with W. Kent, resided much in Italy; made a large collection of prints and drawings especially of churches and altars; brought Joseph Grisoni to England; and drew several of lord Oxford's curiosities; some of the above are at the Society of Antiquaries (WALPOLE, *Anecdotes*), consisting of tombs, etc., in Norfolk, dated 1704-5-8; also 1709 at Pisa, signed "J. Thun"; tombs at Rome; a design 1704 for a very lofty memorial tower, another for the spire of St. Paul's cathedral with the date 1562 thereon. The outline views on the Rhine, Danube, and Waal, 1698; stained glass at Upton Church, 1708, etc., in the scrap volume at R.I.B.A., have his initials. MADOX, *Eschequer*, 4to., 1769, ii, 457, appears to refer to him. He was the first director of the Society of Antiquaries, and died in 1726. His effects were sold April 19, 1727; NICHOLS, *Lit. Anec.*, 8vo., 1812, vi, 159-60.

TALMIS. The modern KALABESHER, in Nubia.

TALON. The French name for a cyma reversa or OGEE, a moulding much used in classic architecture, and from its form suited for bed moulds or supports to projections. S. J. B. 25.

TALUCCHI (.....), chevalier, designed 1794 the large maison de S. Louis de Gonzague, afterwards the hospital of S. Louis, at Turin, having four detached wards at the angles of a hexagonal central chapel, etc. HUSSON, *Étude sur les Hôpitaux*, 4to., Paris, 1862, p. 471.

TALUS. In fortification, the slope of a wall which is thicker at bottom than at the top. It is also applied to an embankment wall. Also called a "tallus wall" in BREES, *Glossary*, 1853. 25.

TAMARAC or HACMATAC; see LARIX.

TAMBER (PEDRO DE DEUS); see DIOS (P. DE), also called VITAMBER (P. DE).

TAMBO. The name given to the curious edifice serving as a resting-place for the Incas when passing from Peru to Quito, CANAR or CANNAR. It recalls the watch-towers at Messene, shown in STUART and REVETT, *Athens*, fol., 1830, iv.

TAMBOUR. A French term for a "drum", used by English writers to denote the naked ground on which the leaves of the Corinthian and Composite capitals are placed, which is also called Bell, and Vase. Also the wall of a circular temple surrounded with columns; and further, the circular vertical part below a dome or cupola as well as above it. S. J. B. 1. 25.

A little box of timber covered with a ceiling within side the porch of some churches to keep out the wind by folding doors.

A round stone or course of stones forming the shaft of a column, but less high than the diameter of the column; DRUM. 4. 19.

TAMPING. The soft material rammed in the hole while blasting a rock, above the gunpowder to confine its action. Sand produces the most efficient material for this purpose. Tamping with sand, small stones, and clay and small stones (whereby any degree of density might be given), are mentioned in INSTITUTE OF CIVIL ENGINEERS, *Proceedings*, 1838, p. 34.

TANEVOT (.....); see TANNEVOT.

TANGENTIAL TRACERY. The form so called by dean Conybeare, *Archæologia Cambrensis*, No. 1, New Series, p. 34; it is said by FREEMAN, *Window Tracery*, 8vo., 1851, p. 10, to be accurate but harsh; he uses "Early Geometric".

TANJORE, Tanjūr, Tanjāvūr, Tallara. A city in the presi-

dency of Madras, in Hindostan, and situated on the river Kaveri or Cauvery. It was not ravaged by the Muhammadans in 1303-10. The great pagoda of xiv cent., "the one great exception" to the indiscriminate erection of these buildings, it having been erected on a well-defined and stately plan persevered in to its completion, consists of two courts 750 ft. by about 250 ft. The large vimana has a perpendicular basement, 82 ft. square, two stories high, above which rises the pyramid of thirteen stories crowned by a dome said to consist of a single stone and making a height of 190 ft.; within the enclosure is the Nundi porch, and several other smaller shrines, one of which dedicated to Soubramaya, a son of Siva, is as exquisite as the temple; this may be one or two centuries more modern. DANIEL, *Views in Hindostan*, 2nd Series, fol., 1805, also shows the bull, xv cent., one of the triumphs of Hindoo art, sculptured out of a solid mass of granite, 16 ft. long, above 7 ft. across, 12 ft. 2 ins. to top of head; probably brought many miles, and oiled so thoroughly as to look like bronze. Outside the town are other quarters, including the British residency, and an English church. SALT, *Views in India*, fol., 1809. ANNESLEY, viscount Valentia, *Travels*, 4to., 1809, ii, 356. HUNTER, *Imp. Gazetteer of India*, 8vo., London, 1881. FERGUSSON, *Indian, etc., Architecture*, 8vo., 1876, p. 343. 14. 28. 50.

TANK. The term is considered to be derived from "stank" or standing water. (Arab. *makhzenima*.) A piece of deep water natural or artificial. CISTERN. PISCINA. RESERVOIR. SWIMMING-BATH. POND. The tanks of India are called *koodh* when having steps all round, as shown in FERGUSSON, *Picturesque Illustrations*, fol., 1847, pl. 50; *bouree*, when having one or more flights of steps, as pl. 17; and *kovah*, without steps. At Seringapatam, the *moota talou* is nearly 30 miles in circumference. About one hundred tanks may be seen at one view from the top of Nundydroog, varying from 6, 8, and 10 miles round; BASIL HALL, *Fragments of Voyages*, etc., in PENNY MAGAZINE, 1845, No. 866, xiv, 464. At Bhubaneser or Bhavaneswara, in Orissa, is the *burrah tellores* or great tank, half a mile square and very deep, having a fine temple in the middle of it. At Bhoj, in Cutch, is one with steps to the edge of the water, and in the middle a terrace for recreation. At Bhopaul, are two large tanks, the sources of the rivers Bess and Patra. The tank called *hussan sagar*, near Hyderabad, 3 miles by 2 miles, is described s. v. BUCHANAN, *Mysore*, 4to., 1807; another edit., 1812, iii, 465. CONSTANTINOPLE contains some five examples.

The system of rain-water supply at Carthage was continued by the Romans; these and others with that at Kairouan, are described by GRAHAM, *Roman Occupation in North Africa*, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1886, p. 160-1. Some in Candia are mentioned in PASHLEY, *Creta*, i, 39, 61; CORNELIUS, *Creta Sacra*, i, 8; FALKENER, *Classical Museum*, 8vo., 1852, ii, 297. The Coradino tank, in Malta, 1841-42, is perhaps the largest covered tank in Europe, being 700,000 cubic feet capacity.

The subjects RAINFALL, RAIN-WATER CISTERN or TANK, RESERVOIR, FILTER, should be referred to: their value in agriculture may be found treated in STEPHENS, *Book of the Farm*, 8vo., 1851, 2nd edit.; STEPHENS AND BURN, *Book of Farm Buildings*, 8vo., 1861; DENTON, *Farm Homesteads*, fol., 1865, 2nd edit. In Flanders, tanks for pure water in every house are sunk below the surface of the earth and built of brick set in tile powder and lime. Others are of brick set in tarras mortar, the excavation being first pugged. Also of planks fastened by trenails or pins to uprights 4 ins. by 6 ins., 30 ins. apart, with a space of 8 ins. of clay pugging and a brick or stone wall. Tanks are also made of stone slabs grooved into each other and set in cement; of Welsh slate; large paving tiles bedded in cement; brickwork; thick timber planks protected by charring and pitching, or lined with lead. The large cast and wrought iron enclosures adapted for manufactories, some of which contain from 1,000 to 6,000 gallons at 3 ft. 6 ins. depth, and from

2,000 to 12,000 gallons at 6 ft. 6 ins. depth. The bursting of one at Liverpool water-works is described in *BUILDER Journal*, 1846, iv, 15, 26: also the tank or cistern at the Crystal Palace, 1880, *BUILDER Journal*, xxxix, 457, 470, 512; 1881, p. 781 at Chelmsford; and at St. George's hospital, London, 3 June 1876. Water received into a tank of brickwork or concrete, whether rendered with cement or puddled with clay, is useless for laundry-work while the tank is new. Tarras used to be relied upon, but it was expensive, and easily cracked, but it kept the water soft; *BUILDER Journal*, 1862, xx, 413, 432. 14.

Brick tanks for drainage purposes, if properly made are suitable for a farmyard: but if only coated with cement are seldom water-tight, especially if the ground be of a loose or porous nature. It has been stated that when large in size brick tanks are expensive; that several small ones may be built at a less cost, and with a saving of drain-pipes. The best and cheapest form is when the length is equal to two or three times the width, and having partitions across them. CESSPOOL.

Thorley's *Illustrated Farmer's Almanack* 1877, gives tables of the contents of tanks, both rectangular and circular. A ready method of obtaining the capacity of a circular tank is stated to be:—Multiply the diameter by itself in inches, and multiply that product again by the depth in inches; then divide by 353 and the quotient will be the content in gallons. There is however an error of one gallon in every 10,000 gallons.

Roberts' "Rain-water separator", used to prevent the first portion (which may be foul) of the rainfall passing into the storing tank, is described with diagrams in *BUILDER Journal*, 1887, lii, 884, with its improvements. The earlier form is given 1886, April 10. Another improvement is shown 1888, lv, 31: also in *BRITISH ARCHITECT Journal*, July 20, 1888, p. vii. Rain-water trap to tank; the difficulties of various sorts presented, are detailed in *BUILDING NEWS Journal*, 1875, xxviii, 194, 222, 305: which also 1867, xiv, 856 gives a remedy for a leaky underground tank, by use of bitumen behind the wall.

TANK is the term also given to the well in which a gasometer rises and falls.

TANK FOR FLUSHING a sewer and other sanitary purposes, is now made self-acting. Hosmer's self-discharging street tank was used in the city of London by order of the Court of Sewers; its action is shown in *CIVIL ENGINEER, etc., Journal*, 1849, xii, 312. Automatic flush tanks were included in the sanitary improvements carried out at the Charterhouse schools, and found to work so satisfactorily that Mr. P. G. Smith, architect to the Local Government Board, communicated particulars of their action to local authorities, and recommended their adoption in connection with drainage works. An iron "tilting tank" to hold about 90 gallons has been used for this purpose. Field's patent automatic cast-iron flush tank; his patent automatic stoneware flush tank, or fat and grease interceptor; his flushing chamber; and his patent annular syphon, *BUILDER Journal*, 1879, xxxvii, 1002. Self-acting galvanized iron flushing cistern. Cast-iron annular syphon and trapping box for town sewers. Silent "quick-charging" syphon for sewer flushing. Lambert's patent regulating supply cistern for a house combines a flushing apparatus. Syer's improved pneumatic syphon cistern, silent in action: and his "Peckham", no rubbers, no valves. Adam's patent automatic flush tank giving an instant start with a drop-by-drop supply; his patent improved automatic flushing syphon; his syphon system for closet, urinal, etc.; his flushing valves and penstocks for sewers and drains. Stidder's patent syphon water flusher. Doulton and Co.'s automatic flush tank; with others by Jennings and Co. 1.

TANNEVOT (JEAN), born 1685, designed at Paris a large number of houses well built and in good taste. Among these were, about 1726, the house of ... Des Vieux, fermier général, and that of ... De Castanier, director of the India company, both in the rue des Capucins: many additions after 1740 to the house (designed by Dullin for mons. Souning), rue de Richelieu, for ... Rolland de Fonferrière: the house for ... de Boullongne, rue S.

Honoré, near the hôtel de Noailles; with after 1751 for ... Richard, receiver-general of finances, many embellishments to the former hôtel de Monbason (designed 1718 by L'Assurance). He was architecte du roi, and 1717 a member of the academy of architecture; and died 1760 or 1762. BLONDEL, *Arch. Française*, fol., 1752-56, p. 87, 111, 114, 143. 5, 68, 112, 113.

ALEXANDRE, born 1692 at Versailles, died 1773, was a son.

TAORMINA (Anc. Tauromenium). A town situated on the north-east coast of Sicily, and probably erected by the Greeks after the destruction B.C. 403 of NAXOS, which was at the foot of the hill. The theatre, mostly of brick, is supposed to have been rebuilt by the Romans; the seats, showing a riser having a section like a lion's claw, similar to those at Iassus, have nearly disappeared; the wall surrounding the *cavea*; the *proscenium* with the back wall of the *scena* and its appendages are well preserved: the passages and saloons beneath it were cleared, and a perfect terra-cotta repetition of the Laocoon, rather less than life-size, was found (*ATHENÆUM*, Feb. 1855, p. 202).

BRINDLEY, *Marble, etc.*, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1887, p. 47, states that the *scena* is Roman, for the coloured columns are similar to those used by them at Pozzuoli and at Arles, the choicest being Africano with rose in it. There are remains of naumachia, or other edifice, piscina or reservoir, fountains, etc. The town was taken by the Saracens in 906, who built the castle on the site of the *arx*. The church of S. Pancrazio is built among portions of a Greek temple. *Illustrations*, Window, circular, pl. 249. LEAKE, *Asia Minor*, 8vo., 1824, p. 322. FASO, duca di Serradifalco, *Antichità della Sicilia*, fol., Palermo, 1834-42, v, part iv. SWINBURNE, *Travels*, 4to., 1783-5, ii, 380. SMYTH, *Sicily*, 8vo., 1824, p. 129. ALLAN, *Mediterranean*, fol., 1843, p. 86. S. NON, *Voyage de Naples, etc.*, fol., 1781-6, iv, 33. GOLDICUTT, *Antiq. of Sicily*, fol., 1819, pl. 28, 33. CASSAS ET BENCE, *Monts. de la Grèce, etc.*, fol., Paris, 1813. HOUEL, *Voyage Pitt.*, fol., Paris, 1782-7. DALY, *Revue Générale*, xvi, 280. 14. 23. 25. 28. 50.

TAP. It is not clear what is the difference, if any, between a tap, a COCK, and a VALVE, the varieties of which are now enormous, including "self-closing" or thumb taps, and "expansive" taps (1882) to prevent boiler explosions. The Greek term was *epistomium*. A very beautiful example of the tap of a water-pipe, in bronze, found at Pompeii, is figured in RICH, *Companion*. SENECA, *Ep.* 86, referring to the luxury of his time, says, even the poor expected Thasian marble in the public baths, and *epistomia* of silver. VITRUVIUS (ix, 11; x, 13) uses the word for a valve in the hydraulic organ, probably what is now called a "pallet".

"TAP" is also the name of the rod prepared for inserting in the "screw plate" by which small screws are made. The plate is made of well-tempered steel having several holes in it, each less than the other, having threads grooved inwards. MOXON, *Mechanick Exercises* (Smithing), 4to., London, 1677, p. 6, 31.

TAPE. A measuring LINE made to wind up in a cover. They were usually made of best linen painted and figured; later they were made with a number of metallic threads woven in the linen, to give strength and to prevent stretching, which is a fault of the ordinary tape, as well as of varying in length by the moisture in the air. Steel tapes are made by joining together thin strips of steel each about 20 ft. long, to even 200 ft. in length. They are lighter and do not stretch: and are marked by an etching process; as Chesterman's patent ribbon steel measuring tape. There is also a patent spring steel tape, 3 ft., 6 ft., 9 ft., and 12 ft. in length. LINE.

TAPE, tie, or band. It is of copper-wire, or lead, and used to fasten a lead casement to the iron bars or stanchions.

TAPE and THABA; see THEBES, in Egypt.

TAPER. All sorts of stuff, or work, that is smaller at one end than the other, and diminishing gradually, are said to taper. The following rule is given for calculating the taper of a spire, pinnacle, etc. Say, as the whole height is to the whole taper, so is one foot of height to the quantity of taper per foot. The

whole taper is equal to half the difference between the diameters of the base and top of the spire, that is (base say 24 ft. 6 ins. diam. — 10 ins. apex) $\div 2 = 11$ ft. 10 ins. the whole taper; then, whole height say 122 ft. 6 ins. = 1470 ins.; whole taper, 11 ft. 10 ins. = 142 ins.; one foot in height = 12 ins. Hence, 1470 : 142 :: 12 : 1.159 inch the taper for each foot in height. *BUILDER Journal*, 1847, v, 366. A mediæval system of arranging the slope or taper of a pinnacle is described *s. v.* PINNACLE. ENTASIS of a spire.

TAPER CHAIN BRIDGE; see DREDGE'S BRIDGE.

TAPER SHELL BIT. A tool used to enlarge the holes in boring, made by rimers and bits. BIT. SHELL BIT. 1. 14.

TAPHOS. A Greek term for a barrow, mound of earth, or stones, as a tomb or memorial. The *taphos* and its surrounding *temenos* of Proteusians at Eleus, was profaned by the Persians. The *taphos* of Opheltes, XII cent. B.C., was surrounded by a fence of upright stones, with altars within the circle, as described by PAUSANIAS, 2, xv, 3. DUDLEY, *Natology*, 8vo., 1846, p. 177, cites Abury in England, as resembling it. 78.

TAPIA, Tappia; Tobi in Egypt. An Arabic term for a wall built of earth and beaten in a case or frame, similar to the Devonshire COB. PISÉ. It is sometimes mixed with lime. Fornatum sive formarium in Africa vel Hispania parietes de terra appellat quomodo in forma; ISIDORUS, xv, 9. Lateribus crudis extria quis ignorat? PLINY, xxxv, 48; and as quoted in GIRAULT DE PRANGEY, *Arch. des Arabes, etc.*, 8vo., Paris, 1841, p. 30. In MARCOCCO, (*tabbi*), is lime mixed with earth; also in the Castiles. The construction of houses in Central America is noticed *s. v.* AMATITLAN. All over South America "tapia" is used in large blocks for fences and boundary walls. They are usually covered with a coping formed of narrow strips of plank, or large stones, or a couch of brushwood for the eaves, the whole being covered with mud plaster. A more permanent coping is formed by a 1 in. plank laid across the wall and projecting on each side and about 20 ins. apart. The wall is then brought up to a saddle-back; on each edge is laid a wood fillet the width of the overlap, a course of adobes or sun-dried bricks is then laid sloping on each side, and the whole covered with lime mortar; *BUILDING NEWS Journal*, 1859, v, 6. The footings must be protected from wet, or have stone foundations. Huts when well built resist violent winds, storms, and earthquakes; and when whitewashed and with a good hard floor, can be kept very clean: *idem*, 1856, ii, 665. The method of building *tapial* is described in DUNLAP, *Central America*, p. 297; and ALSEDO Y HERRERA, *Compendio*, 4to., Madrid, 1741, p. 12. QUARTERLY REVIEW, 1837, No. 58, p. 537; and 1846, No. 77, p. 504. At Gibraltar; in Papers of the Corps of ROYAL ENGINEERS, new series, x, 25. SIMPSON, *Mud Architecture*, in ROYAL INST. OF BRIT. ARCHITECTS, *Transactions and Proceedings* for 1887.

TAPPEN (GEORGE). Wrote *Short Description of a Tour*, 8vo., 1804, enlarged in *Professional Observations on the Architecture of Buildings in France and Italy, etc.*, 8vo., 1806; and with J. NARRIEN, *A new and more effectual method of building Groined Arches in Brickwork*, 4to., 1808. He designed 1812 the entrance front of the Asylum for the Blind, St. George's road (rebuilt 1834); and 1827-8 the Royal Caledonian Asylum, Islington. He died March 1st, 1830, aged 59.

TAR (Ger. *theer*; Swed. *tjära*; Fr. *goudron*). A thick black unctuous substance or gum, chiefly obtained from species of the pine (ABIES; PINUS) in the vast forests of northern Europe, by burning them in a close smothering heat. When vegetable tar is submitted to distillation, an acid liquor (pyroligneous acid) and a volatile oil (oil of tar) pass over; the residuum in the still is PITCH. It softens at 99° Fahr., and melts in boiling water. It is known also as Stockholm and Archangel tar. The juice of the living tree gives TURPENTINE; RESIN is the solid residue obtained from turpentine; TAR is the juice of the dead tree; PITCH is the residue by evaporation of the tar; LAMPBLACK is the soot obtained by burning any of these. NAPHTHA. CREOSOTE. MICHAUX, *Sylva, etc.*, 4to., Phil., 1817-9, iii, 144; new edit.

1850. It is imported in "lasts", each last containing twelve barrels, and a barrel holds about 30 gallons—or about 26½ imperial gallons. Dr. CLARKE's account of tar-making is given in the PENNY MAGAZINE for 1836, v, 49: and the *Resinous products of the Fir and Pine*, in 1843, xii, 42 (also 18, 27, 43). The method of obtaining tar from coal was discovered 1787 by the earl of Dundonald. It is now primarily a bye-product of the distillation of coal for the manufacture of illuminating gas. These two tars are intimately related to the bitumen, asphalt, mineral pitch, and petroleum, obtained in many localities throughout the world. The discovery of "tar colours" rendered the substance of value. This residuum (Fr. *brui*, coal-tar pitch), is a great preservative of building materials: it is said to be much better calculated to preserve wood and iron, as well on land as in water, than vegetable tar; it is said also not to admit or harbour sea-worms. *An Account of its qualities, etc.*, was published by the earl, 8vo., 1785. *On the application of Trinidad pitch to Building and Sanitary purposes*, 8vo., 1857, quoted in *BUILDING NEWS Journal*, 1857, iii, 1004. One-half coal-gas tar and one-half Stockholm tar is stated to be better than a mixture of tar and sulphuric acid for fencing. Upon immersing bricks in it melted at 200°, they are fit for chlorine chambers and condensers for chlorhydric acid. Plaster acquires a strong consistency, and does not crack or give way as when dipped in silicate of potash. Stones covered with coal-tar resist the action of winds bringing salt spray from the sea. PALLADIO, *Architecture*, B. 1, chap. vi, notices that the best way of preserving copper is to lay it in tar, for though it does not rust like iron, it contracts a rust called verdigrease. PRESERVATION. OXIDATION.

A mixture of three parts of American potash and one of unslaked lime left on tarred work for twenty-four hours will entirely remove the tar. A method of mixing gas-tar with lime to make a mortar impervious to water is described in *BUILDER Journal*, 1859, xvii, 225; and another on p. 260.

TAR PAVING. A mixture of gas-tar, sand, shingle, and lime, much used for foot-pavements in the country, and for barn floors; railway platforms; tennis courts; playgrounds, etc. It is considered less tiring, and of less cost, than flagging, and fairly durable. A system was established in or about 1839. A floor of gas-tar and gravel is described in *BUILDER Journal*, 1846, iv, 502, as composed of two bushels of gravel or broken stones sifted through a half-inch gauge; one-third of a bushel of slaked or sifted lime; one-third of a bushel of sharp sand or road stuff; and two gallons of coal-gas tar. The stone and tar to be first mixed gradually by spades on a mortar-board with ledges, till every stone is wetted, and then the lime sifted over and well mixed with it. To be laid 3 ins. thick; then roll with an iron roller as often as possible, and sift sand and lime after the roller where the tar squeezes out. On p. 509, the road for about two miles out of Nottingham to Lincoln was made of a similar manufacture. In 1869 it was proposed to break up stone, screen, and lay it down to a thickness of 2½ ins.; put on a good coating of boiling tar; add lime and sharp sand finely sifted, to ½ inch thickness, and beat down well for two or three days. From about 1875, another manufacturer composed a pavement of tar and limestone. Its toughness is said to render cracking impossible, while a simple dressing with tar and shell at a cost of about 3d. per yard sup. once every few years, prevents deterioration. It is used for roads bearing vehicular traffic, and is then laid of an extra thickness. An improved method, from about 1880, consists of pure limestone and a composition, prepared by machinery, forming a slab of the best artificial stone and a permanent paving. This does not require re-topping. A slate-tar paving for garden paths; and a marble mixture, are also proposed. *Tar and other pavements*, paper read by T. H. Methven, *BUILDING NEWS Journal*, 1870, xviii, 478. *Rock Asphalt and Tar Pavings, idem*, 1870, xix, 73. A new American method, *idem*, 1872, xxiii, 149. Various methods are described in *BUILDER Journal*, 1870, xxviii, 830, 851 (871, 891, 971).

TARANTAISE BRECCIA; see MOUTIERS TARANTAISE.

TARAZANA; see ATARAZANA.

TARBES (the ancient Turba, Tarria, Tarba, Castrum Bigeronum and Bigorra). The capital of the department of Hautes Pyrénées, in France, situated on the river Adour, crossed by a good bridge. There are slate and marble quarries near. As part of the dowry of queen Eleanor, it passed (1253) to the English and remained with them for 300 years; the Black prince (1355-76) held his court in the city. It is the see of a bishop dating from vi cent. The cathedral, or church de la Sède dates from xiv cent., the apse is Romanesque. The Carmelite church of S. Jean; the castle of the counts of Bigorre, now a prison; the prefecture forming the episcopal palace; a modern theatre; and the government *haras* or stud house, comprise the chief buildings. 14. 28. 50. 96.

TARCHESIUS. Living B.C. 400, wrote a treatise on architecture principally on the Corinthian order; he disapproved of the use of the Doric order in temples, advising the Corinthian or Ionic as more appropriate. VITRUVIUS, iv, c. 3. HERMOGENES. 7.

TARDI (ANTONIO), with G. Minutoli and A. Arense designed 1807 the palazzo pubblico at Messina, completed 1829. He finished 1851 the church of S. Andrea Avellino of the Theatines, at Messina. 28.

TARF or TAFF JOINT. A lead pipe is swelled at one end by a wood taff-pin to form a kind of flange; the end of another pipe is put into the swelled end, and a solder joint is made. HELLYER, *Sanitary Plumbing*, p. 50, describes it as the simplest form of wiped joint. This joint is inferior in strength in funnel pipes to the block joint or round joint, and is a mark of the want of skill in joint-making of the plumber. In light pipes, the "taff" gets reduced in thickness and when shaved for the solder there is little or no strength of lead left in the taff or base, therefore such a joint cannot be a strong one. D-TAP.

TAROUILLY (P. M. LE); see LETAROUILLY (P. M.).

TARPAULIN. A sheet of strong canvas covered on one side with a preparation of tar to render it waterproof, and used for the temporary purpose of covering a roof, hay-stack, cart, etc.

TARPUTRY. A place situated one hundred miles south of Vijayanagar, Madras pres., in Hindostan. There are two gopuras belonging to a deserted temple dating about 1400; one quite finished, the other having only the perpendicular portion. The whole is covered with the most elaborate sculpture cut in stone; FERGUSSON, *Indian, etc., Architecture*, 8vo., 1876, p. 375-7.

TARQUINIUM. One of the most ancient towns of Etruria, situated on the river Marta, which empties itself into the sea about four miles below. It may have formed one of the twelve republics of Etruria, consisting of the city and an extensive territory around. The site was on the hill of Turchina, near the modern town of CORNETO, dating from about the viii or ix cent. The necropolis is by far the most interesting of the remains now visible, among which, wall-paintings, *thermae* and temples, mosaics, vases, and other works of art have been found. A *cloaca* exists near the ruins. The first tombs were opened in 1699. DENNIS, *Etruria*, 8vo., 1848, i, 231-384, describes all the most interesting; and in 2nd edit., 8vo., 1878. GAILHABAUD, *Monumens*, 4to., Paris, 1842-52, i, gives the "grotto intagliata" which is the "mercureccia", and is remarkable as being decorated with bassi-relievi. The famous "grotto del Cardinale" has a chamber 54 ft. square, perhaps the largest known, with a flat coffered ceiling at about 6 ft. from the floor supported by four pillars each 6 or 7 ft. square. It is also given in CANINA, *Etruria Marittima*, fol., Rome, 1846-51, pl. 84. A good description of the tombs and their contents is given in THE ACADEMY for 26 June 1875, p. 669. "Il mausoleo" on the Montarozzi is a circular pyramid. BUONARROTI, *Frammenti di Vasi Antichi*, etc., 4to., Florence, 1716. WILCOX and MORTON, *Subterranean Apartments*, etc., described in PHILOSOPHICAL TRANSACTIONS for 1763, vii, 127. VON STACKELBERG, *Älteste Denkmäler der Malerei*, etc., den Hypogäen von Tarquinii, 1827. ORIOLI, *Sepolcrali edifizii dell' Etruria Media*, 4to., Fiesole, 1826. NONN, *Tour to*

Sep. of Etruria, 8vo., London. MICALI, *Antichi Popoli Italiani*, fol., Florence, 1832-34; and *Monumenti Inediti*, fol., Flor., 1841-43. INGHIRAMI, *Monumenti Etruschi*, 4to., Fiesole, 1821-26; and *Pitture di vasi fittili*, 4to., Fiesole, 1835; and 1831-37. BYRES, *Hypogaei, or Sepulchral Caverns of Tarquinia*, edited by F. Howard, fol., 41 plates, 1842. 14. 25. 28. 50.

TARRAGONA (the Roman Tarraco). The capital of the province of the same name, in Spain. It is situated on the coast of the Mediterranean. It is supposed to have been founded by the Phoenicians, of which period massive masonry in foundations and gates still remain in the upper quarter. During the second Punic war (219-201 B.C.) it became a Roman colony; walls of that period remain; under Augustus (45-14 B.C.) it was the capital of Hispania Citerior; in 467 taken by Euric, king of the Goths and levelled; 710 reduced by the Moors under Tarif (the mihrab put in the mosque, 960, under Giafar the architect); taken at the end of the xi cent. by count Raymond IV of Barcelona; rebuilt later by don Bernardo, archbishop of Toledo; during the war of succession it was taken by the English who began to fortify it; and in 1810-11 it was besieged and damaged by the French. The circus 1,500 ft. long is now built upon; several tiers remain of an amphitheatre near the shore which has been used as a quarry. The so-called palace of Augustus (said to have been restored by Hadrian) is now the prison; a curious spiral staircase is supposed to have been part of some hydraulic works; the aqueduct bringing water sixteen or twenty miles, has, about three miles out of the city, a range partly of two arcades rising to a height of about 96 ft., and spanning a valley 700 to 1,000 ft. across (*Detached Essays*, Aqueduct, p. 16 and plate). It was repaired about 1783 by J. Prats; was damaged by marshal Suchet, but again repaired and is now in use. About three miles distant is a large mausoleum called "il sepulcro de los Scipiones". A large number of marbles were shipped to England in 1722 and are now at lord Stanhope's at Chevening near Sevenoaks. In 1851-4 were found an Egyptian tomb, a mosaic pavement, and ruins, as noticed in BUILDER *Journal*, 1854, xii, 6.

It is the see of an archbishop once disputing the primacy with Toledo. The noble cathedral is dedicated to S. Tecla; the east end dates about (1050 or) 1089-1131 (or built 1117); the nave, transepts, and sanctuary are fine Romanesque; the octagonal central lantern end of xii cent.; and a steeple xiv cent. on a Romanesque tower. In 1256 died frater Bernardus, magister operis. The interior is simple Transition. The woodwork of the *coro* is of late date. G. de la Mota and P. de Vallfagona, were maestro mayors of the works, before 1416. The chapel of Sta. Tecla, completed 1775 or 1778 by Josef Prats and C. Salas architects, is rich in local marbles; the baptistery chapel has an antique bath from the palace of Augustus; the chapel de la Virgen de los Sastres, xiv cent. has a curious gallery; the chapel of the Sacrament in the refectory 1580 is by J. AMIGO, about which time Pedro BLAY executed chapels and various works. The west front is chiefly xiv cent.; in which is a fine rose window 1131 by bishop San Oldegario aided by count Roberto Burdet who went especially into Normandy for his garrison and architects. A doorway is given in BUILDER *Journal*, 1882, xliii, 172. The cloisters, now a museum, are of white marble with dog-tooth ornament (BRITISH ARCHITECT, March 26, 1875, p. 177). The very ancient church Sta. Tecla la vieja has Romanesque carvings; and a little church of S. Pablo with Romanesque capitals and acutely pointed vaulting; the other churches are of no interest. The archiepiscopal palace is a good modern work having an Ionic portico and grand staircase on a marble colonnade. The museum is full of Roman and later works. A large Moorish building near the sea is called an arsenal. The east mole commenced 1491 is over 1½ miles long; the west mole commenced 1790 has about 3,900 ft. completed out of 4,650 ft. by John Smith. SWINBURNE, *Spain*, 4to., London, 1779, p. 70. LABORDE, *L'Espagne*, fol., Paris, 1806. 14. 23. 28. 50. 66.

TARRACE. A term used in MOXON, *Mechanick Exercises* (Bricklayer), 4to., London, 1700, p. 7, for a composition used by the ancients; and another used by metallists for lining vessels for melting. **TARRAS.** **TERRACE.**

TARRAGONA (BERNARDUS DE), occurs in a necrology at Tarragona "En 11 de marzo de 1256 obiit Frater Bernardus magister operis hujus ecclesiae". 66.

TARRAS; TERRAS; TERRACE, TRASS (Dutch, *tiras*, cement), (PASLEY, *Limes*, 1838, p. 12). The term is probably derived from the Ital. *terrazzo* used at Venice. It is a blue-black trap, found in the neighbourhood of Liège, at Brohl, and at Andernach on the Rhine, from the size of a pea to that of a middle-sized turnip. Brought down the rivers into Holland, it is there reduced by mills to a coarse powder, so as to pass through a sieve whose wires are about one-eighth apart, and sent out in casks. "It is a sort of tuff or tufo, of a greyish colour, porous in texture, and like pumice. The chemical analysis is alumina 28, silica 57, carbonate of lime 6.5, iron 8.5 = 100. The aluminous parts when ground decompose by exposure, even to the light; it must therefore be packed in bags or casks, and kept in a dark place. Adulteration is effected by mixing up old ground traas with the freshly ground"; DONALDSON, *Stucco, etc.*, in *ENCYC. METROP.*, 1840. Formerly it was chiefly used for walls exposed to water. **LANGLEY**, *London Prices*, 8vo., 1750, p. 40-3, describes the use of "Terrace mortars": and also "Bastard terrace or sea-coal mortar". **CAUTA**, *Natura, etc.*, 8vo., 1772, p. 29, states from whence the "finest tarras" is obtained in French provinces, but he probably means plaster of Paris. "1485 dawber terysing of floris," Churchwardens' Accounts of S. Mary-at-Hill, London; perhaps plasterer covering floor with stucco (?). 1759, part of S. Mary Overies coated with "terras"; **STORER AND GREIG**, *Select Views of London*, 4to., 1804. **FINISHING.** **CIVIL ENGINEER, ETC.**, *Journal*, 1837, i, 26. **BRARD**, *Minéralogie*, 8vo., Paris, 1821, ii, 129.

TARRING (JOHN), F.R.I.B.A., born 1806 at Holbeton, near Plymouth, worked there as a carpenter or plasterer; came up May 1828 to London; studied under Mr. Brown, of Wells street; and obtained a medal at the Royal Academy for a measured drawing. Among the numerous ecclesiastical works, are Akeley church, Bucks; and Christ's church, Chase side, Enfield. 1849 Bethnal Green chapel, the first dissenting place of worship built in London with a spire; those at Bedford new town; Portland new town; Old Westminster; Peckham rye; Falcon square; 1848 Horbury in Harrow road; at Lewisham; and Stamford hill. Huntingdon Union church. For the *Wesleyans*, S. John's hill, Wandsworth; Mostyn road, Brixton; at Clapton, and Malvern: Vine's church, Rochester: *Presbyterian* church, Cork: *Baptists'* church, Victoria road, Leicester. The Congregational churches at Luton, Bedfordshire; Southernhay, Exeter; 1852 at Rochester (*BUILDER Journal*, x, 414); 1851-52, Clapham; Chapel street, Blackburn; at Tavistock with schools; 1850, Southgate terrace, Ball's Pond, London; also 1850 Bedford chapel, Warrington street, Somers Town; and Tolmers square, Islington. Modernised Whitfield chapel in Tottenham court road. *Presbyterian* churches at Lewisham; and in Upper George street, Edgware road.

He designed residences for the late J. Chubb; G. K. Chubb; J. E. Vunner, Owen Edwards, J. Webster, and others at Chislehurst, Kent; Tingewick rectory, Bucks; Tromer lodge, Down, Kent; 1859-60 houses at Queen's gate, Kensington; restored Combermere abbey for lord Combermere; made extensive alterations and restorations at Thornton hall, Bucks., for hon. Richard Cavendish, *CIVIL ENGINEER, ETC.*, *Journal*, 1854, xviii, 404; xix, 141, pl. 12-13: *Executed Examples of Eccles. and Domestic Structures*, 1858: designed Wykham park, and Springfield, both at Banbury; Coedgwgen hall, Glamorganshire; the Congregational Memorial hall, Farringdon street (*BUILDER Journal*, 1872, xxx, 367); the City Bank, Ludgate hill branch, etc. He died 27 December 1875, at St. Andries, Torquay, aged

70. He was styled "the Gilbert Scott of the Dissenters". His youngest son was in partnership with him for some years. *BUILDER Journal*, 1876, xxxiv, 30.

TARSIA and **INTARSIATURA** (Span. *ataracea*). Inlaid wood representing paintings in perspective. Fine examples exist at Bergamo, Perugia, Padua, Venice, Trevigi, Verona, Pavia, Città di Castello. Works by Fra Giovanni, xv cent. in the church of Sta. Maria in Organo, at Verona, are given in GRUNER, *Ornamental Art*, fol., London, 1850, pl. 20-5, the size of the original; pl. 26 is from S. Ambrogio at Milan. Examples at Siena, from the town hall; from Pisa cathedral; the choir at Assisi; and from Orvieto cathedral; are given in WARING, *Arts connected with Architecture, etc.*, fol., London, 1858, pl. 17-21. Fra Damiano da Bergamo *cir.* 1550 excelled all his contemporaries in the art of tarsia: Benedetto da Maiano in the sacristy at Florence cathedral and palazzo Vecchio. The work was taken to Hungary. The Tuscan left the work to the Venetians among whom was fra Giovanni da Verona. Damiano's grandest work is the choir of S. Domenico at Bologna; he died 30 Aug. 1549; his pupils were fra Bernardino, fra Antonio Asinelli, and fra Antonio da Lunigiana, all Dominican lay brothers; **MARCHESE**, *Lives*, 8vo., Dublin, 1850, ii, 215-239. **MARQUETRY.**

TARSUS; the modern **TERSOOS**. A chief city of Cilicia, and one of the most important places in Asia Minor. Few important remains of antiquity are now to be seen there. It is still a chief town of that part of the country. **BEAUFORT**, *Karamania*, 8vo., London, 1817. 23.

TARTAR; see **TATAR**.

TARTÜS; the **ANTARADUS** of the Greeks; see **TORTOSA**, in Syria.

TARVISIUM. The ancient name of **TREVIGI**, in Italy.

TAS DE CHARGE. The French name for the lowest courses of the ribs of vaulting, which are bonded into the wall, forming a solid mass, and receiving the upper stones and taking the weight of the real rib and panel work, from the junction of the vaulting with the wall below. 1. 16. 25.

TASKER (JOHN), "architect and builder", subscribed to **RICHARDSON**, *New Designs in Architecture*, fol., Lond., 1792. He designed Spetchley, Worcestershire, for Robert Berkeley, esq., who laid the first stone 3 May 1811. Tasker (of Mortimer street) was dead in 1822; **NEALE**, *Seats*, Ser. 2, 4to., 1822.

TASK WORK. The same as **PIECE WORK**. **DAY'S WORK**. **LABOUR**.

TASMANIAN TIMBER. A timber trophy was exhibited in London in 1862, including those for building purposes as well as ornamental woods. The Huon pine (**DACRYDIUM**), Blue-gum (**EUCALYPTUS**), and Stringy-bark, were shown in old timbers used for forty years. The Blue-gum is stated to sustain about double the weight of English oak before it breaks. Its mean cohesive power is nearly in the proportion of 3 to 1. *Jurors' Reports* for 1862. Hobart Town is the capital. *BUILDER Journal*, 1863, xxi, 299; 1870, xxviii, 111; and 1872, xxx, 705.

TASSEL or **torsel**, **tossel**, or **tossle**. (Lat. *chelonium*?; Fr. *tasseau*, a bracket). A piece of wood, stone, or iron, laid in a wall for the end of a beam or other timber to rest upon and thus distribute the bearings; it is sometimes called a "pad" or a **TEMPLET**. S. J. B.

A corbel of timber especially under a mantle tree; **CORBEL**. **BRACKET**. Tassels; pieces of board that lie under the ends of the mantle tree: 1736. **CHIMNEY MANTLE**; **FIREPLACE**. "The sloping or bending within the chimneys, otherwise called the tossel or first bending, beginneth from the mantle-tree and reacheth unto the plancher or seeling"; **PRICKE**'s translation, fol., 1670, p. 2, of **LE MUET**, *Manière de bien bastir*, fol., 1647, 2nd edit. 4.

The **PLATE** on which the rafter of a roof pitches (Fr. *couche*). Tossels, with plates to floors, $4\frac{1}{2}$ ins. by 2 ins., and $6\frac{1}{2}$ ins. by 2 ins.; not to a roof; **GRANDY**, *Timber Importer's Guide*, 8vo., 1865, p. 107. **STILL**, *Practical Arch.*, 1819, p. 30, etc., plates.

"The floor with tassels of fir was besprent."—*Tales of a Wayside Inn; The Saga of King Olaf*, iv, by Longfellow.

In shoring, the projecting piece put through the plank and forming a shoulder for the head of the inclined shore from the ground. It is also called needle, joggle, and toggle, and also stud.

TASSO (BERNARDO), a carpenter, designed for Cosmo I 1547-8, the loggia of the mercato nuova at Florence; given in GRANDJEAN ET FAMIN, *Arch. Toscane*, fol., 1806, pl. 57; and in RUGGIERI, *Scelte*, etc., fol., 1755, ii, 46-50; and the entrance door to the parish church (destroyed before 1719) of S. Romolo, in piazza del Granduca; *idem*, i, pl. 21. VASARI, *Lives*, 8vo., 1851, mentions this family of wood carvers, ii, 185, 246; iii, 200; iv, 208, 214; v, 137. 68. 77.

TASTE (Fr. *goût*). The habitual idea of a thing conceived to be the best in its kind; anyone that has a taste in music, painting, or architecture, is like one that has another sense, when compared with such as have no relish of those arts. At the present day, people are hardly agreed among themselves as to what taste really means; VIOLLET-LE-DUC, *Dict.*, s. v. *Goût*; translated in part, in *BUILDER Journal*, 1862, xx, 712. "However there may be a standard of taste, there is no standard of style. I must place the Alhambra with the Parthenon, the Pantheon, and York minster. The same principles of taste are there evident, but the combinations are different. On this principle you may admire Æschylus, Virgil, Shakespeare, and Ferdousi. There never could have been a controversy on such a point, if mankind had not confused the ideas of taste and style." *Home Letters* written by the late earl of Beaconsfield in 1830 and 1831, 8vo., 1885, p. 50. *ÆSTHETICS. BEAUTY.* 1. 6. 14. 25.

TATAR BUILDING, commonly written TARTAR. The name once designated a great number of different nations in Middle Asia and Eastern Europe. It has gradually become a collective name under which are comprehended different nations of Mongol, Turkish, and even Finnish origin. Insugay (Yessugay), father of Genghis khan, a prince of the Water tatars, subdued the White tatars in the middle of XII cent., united all the tribes, and the son gave to them the name of Bede, that is the Blue Bold or the Celestial Mongols. In 1223, they first invaded Russia, and on 9 April 1241 was fought the great battle of Wahlstatt or Leignitz, which prevented the further advance of the Tatars into Germany. At present the name of Tatar is given to the Turks of southern and eastern Russia. In 1263 Marco Polo visited the Golden camp, at Great Serai on the Akhtuba, a branch of the lower part of the river Wolga; founded by Batu, who also founded Serai or Baghji Serai in the Crimea; and new Kasan at a short distance from the old town. He died in 1255. It was the intercourse which Bereke khan (brother or son of Batu khan) had with Egypt and Byzantium, which first enabled the Tatars to secure sufficiently skilled artisans for the building of costly structures; while his conversion to Muhammedanism made his court the resort of the pedlars and merchants of Persia and other homes of Islam. Bereke died near Tebriz in 1265; HOWORTH, *Mongols*, 8vo., 1880, ii, pt. 1, p. 125. Uzbek khan compelled Michael, grand duke of Moscow, to attend at his camp in 1314; he had sent envoys to Egypt with presents and a letter, in which he congratulated khalif Nassir (who married a daughter) on the spread of Islamism to the borders of China (p. 149); HOWORTH, ii, pt. 1, 187, names Majar, Jullad, and Mokhsai, as three towns in Tatary on the Kuma and the Terek. Tatar houses are described in REVULLY, *Travels in the Crimea*, 8vo., 1806, in TURNERELLI, *Kazan, the ancient Capital of Tatar Kings*, 8vo., 1854; and a tomb at Masslof-Knut, on river Podkuma, near Magiar, at the foot of mount Caucasus, in PALLAS, transl. *Travels*, 1793-4, 8vo., London, 1802-3, i, 336, pl. 14. DEGROV, *Nogay Tatars*. 14.

TATHAM (CHARLES HEATHCOTE), born in 1772, became a pupil of S. P. Cockerell. He was in Italy 1794-6, and at Rome 1797, as shown by drawings in sir J. Soane's museum. A volume of drawings from Bologna, Naples, Pola, etc., is in the South Kensington museum. He commenced exhibiting at

the Royal Academy of Arts in 1797. A design for a museum for sculpture by him, was the only English drawing in the academy of S. Luca, in 1802-3. He designed 1802 the statue gallery with other improvements at Castle Howard, Yorkshire, for the earl of Carlisle; and 1807, a picture-gallery at Brocklesby, near Grimsby, Lincolnshire, for lord Yarborough, it is 63 ft. by 48 ft. by 20 ft. high. Henerton, near Henley-on-Thames, at a cost of over £25,000 (sold in June 1848); and, before 1816, all that part of the house west of the old gallery at Cleveland house, S. James's, for duke of Bridgewater, and pulled down by sir C. Barry, for Bridgewater house. He published *Etchings of Ancient Ornamental Architecture at Rome and in Italy*, 1794-5-6, 120 pl., fol., 1799-1803; 3rd edit., 1810; 1826; transl., fol., Weimar, 1805. *Etchings representing fragments of Grecian and Roman Architectural Ornaments*, fol., 1806. *Designs for Ornamental Plate*, fol., 1806. *A Greek Vase in his possession*, 4to. (1811). *The Gallery at Castle Howard*, fol., 1811. *The Gallery at Brocklesby*, fol., 1811. *The Mausoleum at Castle Howard* (by N. Hawksmore), 4to. (1812): and wrote the descriptions for CONEY, *Cathedrals*, etc., fol., 1832; and for other works. A bust portrait nearly full face, 23 ins. by 19 ins., painted by Thomas Kearsley, was sent by George Richmond, R.A., to Exhibition of Old Masters, Burlington house, 1880, No. 12. He was warden of Norfolk college, Greenwich; and died April 10th, 1842, aged 71.

W. TATHAM, wrote *Circular Architecture, being a new method of building*, 8vo., London, 1803.

TATHARIS or TATHYRIS; see THEBES, in Egypt.

TATTERSALL (RICHARD), born about 1803 at Burnley, in Lancashire, was articled to William Hayley of Manchester, and continued in his office until about 1830 when he commenced practice on his own account. His designs in the Gothic styles were considered far in advance of the time. He assisted in the large mills at Carlisle, the iron work being by Messrs. Fairbairn and Lillie; and in the concert hall. His first work was Chasely, at Pendleton, on the Eccles old road, for R. Gardner; several villas; many cotton mills, the chief being for Peter Dixon and sons at Carlisle (fireproof), at that time the largest in the country; the stalk was of the unusual height of 300 ft. 1830 the county infirmary (Greek Doric); 1832-33 S. Paul's church, Staleybridge, Cheshire, in style of end of XIII cent. (COMPANION TO ALMANACK, 1839, p. 221; BRITISH CRITIC, etc., *Journal*, 1840, xxviii, 487-8). 1838, the Manchester and Salford bank, Mosley street, now occupied by Nicholls (CIVIL ENGINEER, etc., *Journal*, i, 235). 1840-41, the Gothic new Presbyterian (Unitarian) chapel at Dukinfield, Cheshire (COMP. TO ALM. for 1840 and 1841); and another at Stockport. Restored the parish church of Ashton; also the Derby chapel in the collegiate church at Manchester. Large cotton works at Goulbourne, Lancashire, for Samuel Brewis. Warehouse behind the royal infirmary, for Geo. Faulkner. Parish schools at Birch. 1842-44 S. Barnabas, Rodney street, Oldham road, for 1,000 persons, cost £5,000 (C. E. AND A. *Journal*, v, 211). Houses at Higher Broughton for Dr. Radford and Mr. Armstrong. S. Luke's rectory, Cheetham; and numerous other buildings, including 1842-45, the moral and industrial training schools at Swinton (the type of Dickens's *A visit to a pauper palace*), cost about £40,000 (C. E. AND A. *Journal*, viii, 129). This work proving too great a strain (he had become stone deaf at end of 1835), he took T. Dickson as partner, and died in 1844 (in confinement) at the house of his uncle William Crossley (now known as Bishop's Court, Higher Broughton, the episcopal residence of the bishop of Manchester); Dickson later took W. H. Brakspear as partner and completed the building. J. S. Crowther, of Manchester, was a pupil until Sept. 1843. J. S. C. A. W. M.

TATTERSALL (GEORGE), was 1839 surveyor to the Brewers' company in London. He wrote *Sporting Architecture*, 4to., London, 1841; 2nd edition 1850; and designed 1840-41 the school at Lady Owen's almshouses, Goswell road, cost £6,000 (*BUILDER Journal*, 1843, i, 338). He died August 17, 1849.

TATTI (JACOPO), born January 1477 (not 1479) probably at Florence, also a sculptor, was son of ANTONIO TATTI of that city. He became a favourite pupil of Andrea Contucci, of Monte Sansavino, and hence like his master was called SANSAVINO (pronounced Sansovino by the Florentines). Whilst young, he designed the architecture of the lavatory, etc., in the house of Bindo Altoviti, now Rosselli, in Borgo S. Apostolo for B. da Rovezzano the sculptor (iii, 131). Jacopo was taken by G. Sangallo to Rome, became a friend of Bramante, and executed a statue of high merit, but his health failing, he 1514 returned to Florence, where he designed 1514 a Corinthian façade in timber to Sta. Maria del Fiore, which with its sculptures, and its paintings by A. del Sarto, his friend, received high praise (iii, 260); it was removed 1584. Designed a triumphal arch at the gate of San Gallo for the return of pope Leo X from Bologna; and made a design for the façade of San Lorenzo (model by B. Agnolo), but that by Michael Angelo was preferred (before 1513, v, 268). Returning to Rome, he designed some works at the Vigna de' papa Giulio, via Flaminia (LETAROUILLY, *Rome Moderne*, fol. 347; 421-70, pl. 199-221); a large building at the Vigna near the aqua Vergine, for Ant. Fabiano, cardinal di Monte; the loggia, via Flaminia, outside the porta del Popolo, for Marco Coscia; 1519, the Servite church of S. Marcello (iv, 90), the façade by C. Fontana and finished later; a house for Luigi Leoni; and about 1520, the large palazzo, via de' Banchi for Giov. Gaddi (later Fil. Strozzi, and Niccolini, LET., 158, pl. 14). For the church of S. Giovanni di Fiorentini, his design was accepted against Raffaello, Ant. da San Gallo, and B. Peruzzi, the foundations (iv, 6-7) being intricate he 1527 left the work to San Gallo and went to Florence (it was continued by G. della Porta, C. Maderno, and A. Galilei 1734 did the façade; LET., 541). There he added the façade to the palazzo Lante, in the piazza de' Caprettari, begun 1513, planned by Bramante (died 1514); added to by O. Lungi, (MELCHIORRI, *Guida*, Rome, 584; LET., 343-351, pl. 153-6), and restored 1760 by C. Murena; thence went to Venice, to Rome, which he left 1527 on the sacking of the city, retired to Venice, thence to France, but returned to Venice, where the doge Andrea Gritti (1509-38) employed him to repair (p. 278) the domes of S. Marco, the centre one of which he strengthened with iron hoops, etc. For this approved work he was appointed April 7, 1529, "proto" or chief architect of the signori procuratori, with a house and salary of 80 ducats raised to 120 and 180; erected various shops and houses for his masters; by 1535 had designed the stalls for the choir; and a loggetta for the nobles and others on one side of the campanile of S. Marco (p. 285) now used by the procuratori di S. Marco when on guard; they were finished by Scamozzi and others. In 1532 he continued the Scuola de' confraternita della misericordia, begun 1508 by A. Leopardi (died 1510 or 1515), continued by M. Lombardo, and still imperfect. The interior of the church of S. Francesco della Vigna for doge A. Gritti; (the dome and façade were by A. Palladio [p. 281], but is still unfinished). 1536, the biblioteca antica of S. Marco (p. 287-8), now part of the palazzo reale, where part of the vaulting falling, he was imprisoned, fined 1,000 ducats, and deprived of his office as "proto": he was restored 1547, and rebuilt the vault of reed work plastered. He designed the palazzo at S. Girolamo for Leonardo Moro; another large one for Luigi de' Garzoni, at Ponte Casale; also the rotunda in the pal. Grimani for a collection of casts; and the palazzo on the canal grande a S. Maurizio (p. 292) for Barbarigo or G. Cornaro. The sala delle quattro porte in the ducal palace is by Palladio, who with Jacopo gave the design for the ceiling executed by Vittoria. La zecca, the mint (p. 282), of stone and iron, the cortile of which is by Scamozzi. The church of S. Spirito on the Lagunes, since destroyed. The palazzo Dolfin or Delfino, later Manin Tiepolo, on the canale grande a S. Salvatore (p. 294). The church of S. Giorgio de' Greci (p. 297-8, is attributed to him, but is by Chiona and Sante Lombardo). The completion of that of S. Maria mater

Domini (p. 189). The church of S. Fantino, one of the finest in Venice, with a rich chapel of the Composite order, with dome; that 1514 of S. Martino near the arsenal; and that of the Incurabili (elliptical); the scuole di S. Giovanni degli Schiavoni; 1553 the interior and exterior decorations to the church of S. Giuliano in the Merceria (p. 299); the fabbriche nuove at the Rialto (p. 284), especially the one for commerce, of three floors; 1554, made a design, with other architects, for the bridge of the Rialto; designed 1556, the fine church of S. Gimignano, on the piazza of S. Marco (p. 295), (the chapel therein 1505 was by C. del Legname), which was demolished 1807 by prince E. Beauharnois for the palazzo reale. The scala d'oro in the ducal palace (p. 287), and with 1566 the two large statues of Neptune and Mars at the top of the Giant's staircase. The tombs of signor Podacataro in S. Sebastiano (p. 301), and of doge F. Venier in S. Salvatore with two statues (p. 300). He also designed and executed in twenty years the fine bronze gates to the sacristy, for Fed. Contarini, introducing portraits of himself, Titian, and Aretino; and the eight bronze statues of the evangelists and fathers at the high altar, of S. Marco.

At Brescia, he partly rebuilt S. Pietro in Olivete; and continued the palazzo della loggia, finished by A. Palladio (ZAMBONI, *Brescia*, fol. 1776-88, p. 59, 60, 134; *Illustrations*, 1861, pt. 2). At Padua, the loggia del consiglio has been attributed to Jacopo, but it is by A. Bassano (ROSSETTI, *Padua*, 303); he designed the Bo, or university, attributed to A. Palladio (p. 305); began 1524 the cappella del coro of the cathedral, continued by Almerico and G. Gloria (p. 129; 168); and the cappella dell' arca del Santo, with G. M. Falconetto, at S. Antonio di Padova (CICOGNARA, *Scultura*, fol. 1813, i, 216). At Fano, the magnificent church of the canons regular of S. Paterniano; the campanile is one of the finest in the Papal States (PETIT, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1854-55, p. 96). At Ferrara, the church in the campo santo 1498-1551 (restored after earthquakes of 1570 and later). Additions at Verona to the façade of S. Giorgio, with Ionic doorway to the palazzo della Ragione; and additions to the cathedral at Udine. B. Ammanato was a pupil.

He died November 2, 1570, at Venice, aged 93, and was buried in his chapel in San Gimignano; but when pulled down in 1807 his body was removed to the church of S. Maurizio. He left a rich estate to his son Francesco Sansovino, born 1521, who wrote a description of Venice, 1663. Scamozzi refers to a work by Tatti on the construction of floors, and the prevention of dust falling through the joints of the boards. VASARI, *Vita di J. S.*, notes by J. Morelli, fol. Venice, 1785; 2nd edit. 1789; and one by Antonelli. CARLEVARI, *Fab. di Venezia*, fol. Venice, 1703, pl. 12, 34, 41, 51, 54, 55, 72, 74. FEDERICI, *Memorie Trevigiane*, 4to., Venice, 1803, ii, 66-8. TEMANZA, *Vita di S. J.*, 4to., Venice, 1752; and his *Vite*, 4to., 1788, ii. QUATREMÈRE DE QUINCY, *Vies*, 4to., Paris, 1830, i, 267. SELVATICO, *Venezia*, 8vo., Venice, 1847, p. 278-307, to which the above references (p. ...) apply. MAGRINI, *Ponte di Rialto*, 8vo., Vicenza, 1854, p. 9, 18. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Proceedings*, 1888, p. 196. CICOGNARA, *Fabbriche di Venezia*, fol. Venice, 1838-40; and *Storia del Scultura*, fol. Ven., 1813-18, i, 216. VASARI, *Lives*, to which the references of vol. and page in brackets refer. 3. 25. 26. 30. 68. 112. 113.

TAURIFORM; see BULL'S HEAD; BUCRANUM.

TAURINI; see TURIN, in Italy.

TAUROMACHIA, or Bull fights of Spain, 26 pl., by Lake PRICE, fol., 1852, showing the amphitheatre or circus at Madrid, Seville, and Cadiz. BOURGOING, *Spain, its Topography, etc.*, 4 vols., 8vo., 1808. ABENAMAR, *Filosofia de los Toros*, 12mo., Madrid, 1842. DELGADO, *Tauromaquia o Arte del Torear*, Cadiz, 1796, 8vo., 30 pl.; Madrid, 1804; and Barcelona, 1834. SALGADO, *Description of the Plaza or Sumptuous Market-Place of Madrid, etc.*, 4to., 1683; *Tauromaquia Sevillana, descripcion de los juegos de Toros de Sevilla*, 4to., 1794. BEDOYA, *Historia del Toro, etc.*, fol., 12 pl., Madrid, 1850.

TAUROMENTUM. The modern TAORMINA, in Sicily. 25.

TAUKOPOLIS. A former name of APHRODISIAS, in Asia Minor.

TAVERN. A house open to the public where wine only was sold. The Act of Edward VI, 1552, restricted the number of taverns to 40 in London, 8 in York, 6 in Bristol, 4 in Exeter, Gloucester, Chester, Canterbury, Cambridge, Newcastle-upon-Tyne, Norwich, and Hull, and 3 in Westminster, Lincoln, Shrewsbury, Salisbury, Hereford, Worcester, Southampton, Ipswich, Winchester, Oxford, and Colchester. *London Suburban Taverns*, BUILDER *Journal*, 1873, xxxi, 424. HOSTEL. HOTEL. INN. 1.

TAVISTOCK SLATE. A slate obtained from two quarries near Tavistock, in Devonshire. The Mill Hill quarry supplies slates of rather coarse greenish colour. The Lew quarry, Lewdown, near Coryton, supplies slates of most sorts for slating and other purposes; they are known to be exceedingly durable.

TAVIUM. The chief fortress of the Trocmi, now represented by Boghazkoi, in Asia Minor or by Tshorum. LEAKE, *Asia Minor*, 8vo., p. 311. Pterium, now Boghazkeni was discovered by C. TEXIER, *Asie Mineure*.

TAWNY COLOUR (Fr. *basané, bruné, hâlé, tanné, tanné*). Yellow, like things tanned; JOHNSON, *Dict. NARE, Dict.* Perhaps derived from tawe, to dress leather. The colour of the skin of the lion; also of the skin of a Nubian. In mediæval decoration, labels with inscriptions were often of a tawny or parchment colour ground to throw up black letters into greater distinctness.

TAXIS. The Greek term, Roman "ordinatio" or fitness, used by VITRUVIUS, i, 2, to signify that disposition which assigns to every part of a building its just dimensions. Modern French architects have given the word "ordonnance" to it; ORDINATIO. 1.

TAXODIUM DISTICHUM or Cupressus disticha. The bald cypress of the swamps of the United States, from Washington to the tropic of Cancer. It attains a height of 120 ft. The timber is called black cypress or white cypress in Georgia and the Carolinas, according to the colour of the wood, which is considered to be far superior, when thoroughly seasoned, to any species of pine; shingles of it are said to endure for forty years. The posts found in the chamber discovered about 1800 in the teocalla at Cholula, were considered to be of this wood, by HUMBOLDT, *Voy. Pitt.*, fol., Paris, 1810, p. 29. MICHAUX, *N. A. Sylva*, 4to., 1817, iii, 238-45. CUPRESSUS. 14. 71.

On the slopes of Sierra Nevada, in California, about 5,000 ft. above the level of the sea, grows the Taxodium giganteum, evidently of the cypress lineage, a species of Taxodium of DON. In its early growth it has the foliage of the common Redwood or Tax. sempervirens. It attains a height of 322 ft. and upwards of 29 ft. circumference. The wood is light and buoyant, the colour of cedar, but without the smell; the heartwood is coppery red and lustrous, grain straight and easy splitting, lasting, but soft. The colour of the bark is a rich cinnamon brown, shreddy fibrous, 1 to 1½ ft. thick. BUILDER NEWS *Journal*, 1857, iii, 336.

TAXILA; the ancient; now represented by SHAH DEHRI; FERGUSSON, *Indian, etc.*, *Architecture*, 8vo., 1876.

TAXUS; see YEW.

TAYO, now written TEAK.

TAYGETUS MARBLE. See HERBOSUM MARMOR; and GREEN MARBLE.

TAYLOR (GEORGE LEDWALL), born 1780 in London, was 1804 a pupil of W. Parkinson of Ely place. He visited France, Italy, Greece, and Sicily in 1817-19, and again in 1857-68. On June 3, 1818 he, in company with John Sanders, E. Purser, and E. Cressy, discovered the Lion of Cheronæa, as stated by him in BUILDER *Journal*, 1862, xx, 908. He published with E. Cressy, *Architectural Antiquities of Rome*, fol., 1820-22; 1826; new edition 1870; *Architecture of the Middle Ages in Italy* (Pisa), fol., 1829; and *Revived Architecture of Italy;—palaces* ARCH. PUB. SOC.

of Genoa, fol., 1822. He also wrote *Stones of Etruria and Marbles of Ancient Rome*, 4to., 1859; and *Autobiography of an Oecogenarian Architect—during 65 years*, 2 vols., 4to., 1870-72. *Account of the Methods used in Underpinning—at Chatham Dockyard in 1834*, read 4 July 1836, printed in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 4to., i, 40; in *Prof. Papers of the corps of Royal Engineers*, by Lieut. W. Denison, 4to., 1844, i, 26-8, and in *Autobiography*, p. 167. Also *Roofs constructed over some of the Admiralty docks and building slips*, read 16 Jan. 1837; *Gas Works and Cannel coal gas*, read 7 Feb. 1848, and published as a pamphlet; and *Ancient Roman and Etruscan Architecture*, read 24 January 1849.

In 1824-27 he held the appointment of civil engineer and architect to the naval department of Great Britain, on death of Mr. Holl, and completed the great works at Sheerness; at Clarence Victualling Yard, Gosport, and Melville hospital, Chatham, Woolwich river wall, etc. 1823-4 with E. Cressy he designed a building for casts, etc., in Suffolk street, Pall mall (MIRROR *Journal*, iii, 88); 1836 the proprietary school at Lee, of concrete; the east side of Trafalgar square in flats of offices, as his own property, and 1837 south side and west end of Hyde Park square, all Chester place, and south side of Gloucester square (80 houses), and No. 140 Westbourne terrace, and took five acres of the bishop of London's estate; also 1849 designed the works of the North Kent railway. He died April, 1873.

TAYLOR (JOHN), jun., M.A., F.S.A., designed the stations on the London, Chatham, and Dover railway, including that at Blackfriars; 1856 S. Mary's church, Spring grove, Isleworth; BUILDER *Journal*, xiv, 680 and 691, with his patent stone facings; and 1858-9 New Buildings at Roupell park, Brixton. He published *Patent Improved mode of constructing walls*, fol., London, 1849; and read *Sundry Sanitary Building Appliances*, at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 12 Jan. 1863. The "damp proof course" was a slab of stoneware perforated horizontally; the patent was bought 1860-61, by George Jennings. His patent for roofing tiles was sold 1865 to the Broomhall Tile and Brick company; BUILDING NEWS *Journal*, 1871, xx, 75. He died before 1878.

TAYLOR (JOHN HENRY). Repaired 1825 the interior of S. Margaret's church, Westminster; designed 1829 S. Ann's Society Schools, Brixton hill, for 100 boys and 50 girls (vacated 1887); 1835 Albany (Dissenters') chapel, Frederick street, Hampstead road; and 1854 the infirmary to the Infant Orphan Asylum, at Wanstead, £5,000. He died in or about 1865.

TAYLOR (SIR ROBERT), born 1714, the son of a great stonemason of London, residing in Essex, became a pupil of sir Henry Cheere, sculptor. At an early age he visited Rome, returned on his father's death in poverty; commenced by the help of ... Godfrey of Woodford as a statuary, and carved 1743-6 two monuments in Westminster abbey; the figure of Britannia at the bank of England; and the sculpture in the pediment of the mansion house. His first architectural design was a house formerly No. 112, Bishopsgate street within, for John Gore (not Gower), esq., of Bush hill, Edmonton; *the villa, in Bath stone, on the banks of the river Thames at Richmond for sir Charles Asgill, bart., occupied by Mrs. Palmer in 1824 (WOOLFE AND GANDON, *Vitruvius Britannicus*, fol., 1767, i, pl. 74; WATTS, *Seats, etc.*, fol., 1779, pl. 35); *a house at Purbrook, Portsdown hill, for sir P. Taylor; 1736 house in Piccadilly for duke of Grafton; library and dining room at Arno's Grove, Southgate, Middlesex, for George Colebrooke, esq. (WATTS, *Vicars*, pl. 63; BREWER, *London, etc.*, 8vo., 710: occupied by John Walker, esq., in 1822, PATTERSON, *Roads* by Mogg, 1822, p. 306); Gopsall hall, Atherstone, Hertfordshire, for lord Howe; additions to Longford castle, Wiltshire, for lord Radnor; 1755, Chilham castle, Kent, for James Colebrooke, esq., with a singular mausoleum on the north side of the chancel 42 ft. diameter with a dome (NEALE, *Seats*, 4to., Ser. 2, ii). 1756, alterations to The Grove, Watford, Hertfordshire, for lord Clarendon; 1756 Stone

Buildings, Lincoln's Inn; *1756 house at Danson Hill, near Woolwich, Kent, for sir J. Boyd, bart.; *cir.* 1756 *banking house for sir Ch. Asgill, bart., No. 70, Lombard street, afterwards the Pelican Life Assurance company; 1756-58 the large arch to London Bridge, in conjunction with G. Dance; 1766-71-83 large additions to the bank of England, as the *wings on each side of Sampson's original façade, *the 4 per cent. reduced annuity office, *the transfer and other offices, and the *quadrangle still containing the Bank parlour (MALTON, *London and Westminster*, 4to., 1792, pl. 63), where he was succeeded 1789 by sir John Soane who removed most of these works; 1772 *cir.*, *Ely House, Dover street, Piccadilly, for bishop Keene; sundry works at Ely cathedral; 1772, Thorncroft, Leatherhead, Surrey, for Henry Crab Boulton, esq. (BRAYLEY, *Surrey*, 4to., 1841, iv, 431); 1775-77 the Six Clerks' and Enrolment offices, Chancery Lane, under 14 Geo. III, c. 43, and 15 Geo. III, c. 56; 1776, *Long Ditton church, Surrey, cost £1,508; (a Gothic design* shows a spire executed at Wallingford); 1778-85, *Gorhambury, near S. Alban's, Hertfordshire, for lord Grimston, afterwards earl Verulam (NEALE, *Stats*, ii); *Heveningham hall, Suffolk, for sir Gerard Vanneck, bart., façade 200 ft. long, west end added by J. Wyatt (NEALE, *Stats*, iv); and 17... commenced Coldbath fields prison or house of correction, continued by sir W. Chambers and T. Rogers. He also designed (some dates unknown) "Bank Buildings", the two blocks of houses between Threadneedle street and Cornhill, pulled down for the extension of the Royal Exchange; *assembly rooms in the old exchange at Belfast; Normanton hall, Rutlandshire; Harleyford, Buckinghamshire, for sir W. Clayton, bart.; No. 15, Philpot lane, City; the house at the corner of Whitehall yard (? lord Carrington's); Nos. 35 and 36, Lincoln's Inn Fields, No. 36 rebuilt 1859 (GENTLEMAN'S MAGAZINE, 1820, xc, 38); *Coptfold hall, Essex, for Richard Holden, esq.: faced with stone the original Carlton house, Pall mall (CUNNINGHAM, *Handbook*, 8vo., 1850, p. 97); *1778 the council house at Salisbury, for earl Radnor, carried out with alterations by his pupil W. Pilkington; and **cir.* 1780 the bridge at Maidenhead, Berkshire, of seven large stone semi-arches and three small brick arches at each end, cost £19,000: the bridge of five arches at Henley-on-Thames attributed to him is by W. Hayward.

He was one of the three principal architects attached to H.M. Board of works; surveyor to the admiralty; laid out the property of the Foundling hospital, of which he was a governor (J. W. HORT); surveyor to Greenwich hospital, succeeding J. Stuart; surveyor and agent to the Pulteney and many other estates; and sheriff of London 1782-83 when he was knighted. Among his pupils were C. Beazley, W. Pilkington, J. Leach, (afterwards vice-chancellor sir John); C. A. Craig, S. P. Cockerell; and John Nash. An engraved portrait is in the CROWLE PENNANT at the British museum, xii, 93 and views 88-90. A folio volume of 32 plates of his designs, drawn and engraved in aquatint by T. Malton, was published 1790-92, the subjects are marked with an *.

He died Sept. 27, 1788, aged 74 (Sept. 26, aged 70, is on the large tablet in Poets' corner, Westminster abbey), at No. 34, Spring gardens (existing in 1846 as left by him), after attending the funeral of his friend sir C. Asgill, bart., and was buried in a vault near the north-east corner of the church of S. Martin-in-the-fields. The bulk of his fortune of £180,000 was left for the erection at Oxford of a proper edifice therein and for establishing a foundation for the teaching and improving the European languages: owing to certain contingencies the bequest did not take effect until 1835: the lecture-rooms, classrooms, and library forming the Taylor buildings, combined with the University galleries were built 1841-49 from the design of C. R. Cockerell, R.A.: they are known as the Taylor and Randolph buildings. *BUILDER Journal*, 1846, iv, 505. CIVIL ENGINEER, *ETC.*, *Journal*, 1847, x, 340, criticism by J. Elmes. DALLAWAY, *Anecdotes*, 8vo., 1800, p. 154. GENTLEMAN'S MAGAZINE, 1788, lviii, 930; 1070.

3. 14.
His son, the right hon. Michael Angelo Taylor, was a member

of parliament, and his name is attached to the well-known and still acted upon Act of Parliament 1816-7, 57 George III, c. 29, relating to paving, etc., the metropolis. He died July 16, 1834, aged 76, and was buried in the family vault. GENT.'S MAG., new series, ii, 430.

TAYLOR (THOMAS), of Leeds, designed 1817 "one of the best formed modern churches of plain character", at Birstal, Yorkshire, proportioned so as to admit of no galleries in the aisles; he never equalled it in the numerous churches which he subsequently built, having in all to provide sufficient height for side galleries. R.D. CHANTRELL, in *BUILDER Journal*, 1847, v, 300.

TAYNTON STONE; see TEYNTON STONE.

TAZZA. The Italian term for a flat cup with a foot and handles; a shallow vase. A red porphyry basin 47 ft. 4 ins. in circumference, found in the Baths of Titus, is now in the Sala rotunda of Pius VI, at the Vatican. A flat cup of terra-cotta with a foot and handles, discovered at Nola, is now in the museum at Naples. The font in the duomo at Pietra Santa, is an ancient tazza with statues of sea gods.

TCHAVDERE. The former AIZANI; LABORDE, *En Orient*, fol., Paris, 1838.

TCHERNIGOF; see CZERNIGOF, in Southern Russia.

TCHERNOVITZ; see CZERNOVITZ, in Austrian Galicia.

TCHOU-TSE. The bamboo; called *Chok* at Canton. *Detached Essay, Chinese Architecture*, p. 1. BAMBUA.

TEA. It is imported in chests, called "half", weighing 54 lbs.; and 48 lbs.; "quarter", weighing 13, 13½, and 23 lbs.; also called "caddies". But these vary according to the quality of the tea, as stated in GWILT, *Encyc. of Architecture*, Glossary, s. v. Weight, edit. 1876 and 1888; which gives the mean weight as 5.276 lbs. per foot cube.

The Bohea chest is 2 ft. 9 ins. × 1 ft. 10 ins. × 1 ft. 8½ ins.

Hyson, is 1 ft. 6½ ins. × 1 ft. 6 ins. × 1 ft. 9 ins.

Congo, is 1 ft. 10½ ins. × 1 ft. 8½ ins. × 1 ft. 4½ ins.

Souchong, is 1 ft. 7½ ins. × 1 ft. 7½ ins. × 1 ft. 7 ins.

Twankay, is 1 ft. 11½ ins. × 1 ft. 6 ins. × 1 ft. 8 ins.

TEAGLE-POST. The main post that is under the ends of a tie-beam in a timber-built barn; one end of the clitch-brace (or strut) being framed into the teagle-post, and the other end into the underside of the tie-beam.

R. R. R.

TEAGLE or tackle. The small rope or ropes by which goods are heaved into or out of a ship. At one end is a pendant with a block, and at the other a block and hook to hang the goods from. The rope to a modern lift is sometimes called the teagle. The Manchester or Lancashire teagle is the most common form of hoist that is known, deriving power from a lay shaft in connection with the manufacturing portion. It is carefully described by WHICHORD, in *Royal Institute of British Architects, Sessional Papers*, 1863-64, p. 80-1.

TEAK or TAYC; see TECTONA GRANDIS.

TEANO. (The ancient Teanum, capital of the Sidicini.) A town in the province of Lavoro, in the kingdom of Naples. A Roman theatre retains many of the underground vaults, and there are ruins of an extensive amphitheatre. The massive and extensive castle of the duke of Sessa is a good specimen of Angevine architecture 1266-1435; it has stabling for 300 horses. The town is the see of the bishop of Teano and Calvi; the cathedral dedicated to S. Giovanni apostolo e evangelista was erected from the designs of Vaccaro. It has 16 ancient granite columns inside, with other remains of former structures: at the entrance are two sphinxes of red granite. There are three parish and two collegiate churches, and the cloisters of a suppressed monastery.

28. 50. 96.

TEARING. The ultimate strength of a bar is the actual stress required to pull it asunder in the direction of its length; this is generally measured in tons and assessed at per square inch. Under test, the stress is applied gradually, the result being taken at about every 5 or 10 tons, or in pounds, as may be desired. "Working load" is, as a rule, the proof load, and is the factor of safety allowed to each kind of material, being a

quarter, sixth, or tenth, of the ultimate stress. When desired to prove beyond the working load, great care is required to avoid damage to the material to be used. **STRENGTH OF MATERIALS.** **TENACITY.** **TENSILE STRENGTH.**

TEAZE or TEAZLE TENON. The tenon at the top of a post, with a double shoulder and tenon from each, for supporting two level pieces of timber at right angles to each other. The cheats or relish of the teazle tenon; see **RELISH**.

TEBESSA (the Roman **THEVESTE** or **Thevessa**). Tebeste, now Tibesh, probably the Tipassa of **BRUCE**, *Travels*, intro., p. 26 (**GIBBON**, *Decline*, edit. 1854, iv, 500). The last and most remote town in South Algeria. It was of no importance till the close of the second century, when it became one of the richest and most populous in North Africa. The quadrifrontal form of arch with two *tetrastyles*, is very rare (Janus at Rome, and Tripoli); it was erected by the family of Cornelia, Caius Cornelius Egriliannus, but is commonly called the arch of Caracalla from having had a statue to him and Geta. The small tetrastyle temple, erected about 300, to Jupiter or Minerva, is of a hard fine-grained limestone with marble columns; the order is not of the usual proportions, there is no architrave. The ruined basilica dates not later than the end of first century; almost destroyed by the Moors in vi cent.; it stood on the north side of a Forum approached through two lofty gateways, the arch of one is still standing; the aisles formed a gallery; there was a good mosaic pavement. It was restored 539 by Solomon, the successor of Belisarius. He built shops on three sides and enclosed the whole with a wall 25 ft. high and twelve towers, to serve as a fortress if necessary. Near the Constantine gate was discovered a *lararium* by abbé Delaport; **GRAHAM**, in **ROYAL INSTITUTE OF BRITISH ARCHITECTS**, *Transactions*, 1885, p. 150-3, pl. lx, lxi, lxiii: plan of basilica, 1886, p. 174. A description of the town, by general Négrier on the French occupation, is given in **PENNY MAGAZINE**, 1842, p. 328.

TEBI. The Egyptian sun-dried brick, made in a mould, of clay mixed with straw, pounded pottery, and other materials, extensively used in ancient Egypt. Some objects occur, of the time of the XIIth and following dynasties, made of baked red terra-cotta, of conical or square shape, the use of which is not decidedly known. The *tebi* vary in dimensions from 1 ft. 8 ins. to 1 ft. 3 ins. long, and from 8½ ins. to 4½ ins. thick, and weigh about 16 lbs. The largest are those of the dynasties before the VIth, and they become of smaller dimensions under the XVIIIth and following dynasties. At the earlier period rude marks, spirals, curves, or devices made by pressing the finger or fingers of the hand into the moist clay, were impressed on the bricks; but at the time of the XVIIIth dynasty stamps were introduced of an oval or square shape, having in relief the pre-nomen, or name of the monarch, or the names and titles of the persons for whose buildings or constructions they were made. They continue till the XXIInd dynasty. These bricks were used in pyramids, palaces, houses, fortresses, walls, etc., the absence of rain making them sufficiently hard to withstand the climate. Representations of their manufacture by captives or prisoners, corresponding with the account of the bondage of the Israelites, are seen in paintings in the tombs of the XVIIIth dynasty. (**BIRCH**.) **COOPER**, *Archaic Dictionary*, 8vo., London, 1876. **ADOBE.** **TAPPIA.**

TÉCASSIR. The Arabic for a tribune or gallery in a mosque for the use of women. **GIRAULT DE PRANGÉY**, *Architecture Arabe*, 8vo., Paris, 1841, p. 31.

TECHNICAL SCHOOL. Technical education is that specific training and teaching required to fit a person for any trade, profession, or other calling in life, over and above that general education which every person ought to possess according to age, sex, and other circumstances. Hence it is needed as much by lawyer and doctor, housemaid, ploughman, soldier, gardener, and cook, as by carpenter, bricklayer, bookbinder, or tailor. We must not forget that the line of demarcation between general and technical training is scarcely a rigid one; that if

technical education is to be of real service it must have a really sound general education to build upon. Care must be taken not to make a young man too much of a specialist, but rather an "all round man" with a speciality; **THORNE**, in *Companion to the Almanack*, 1885, p. 43-56. **ROBINS**, *Technical School and College Buildings*, 4to., 1887; contains buildings for Applied Science and Art Instruction, Foreign and English; their fittings: Technical Schools, etc.; heating and ventilating generally, and as applied to the above; planning of buildings for middle-class education generally; sanitary science in its relation to Civil Architecture; etc.

TECTONA GRANDIS; **TAYC** or **TEAK** (Ind. *Tekka*; *Sagoon*). The oak of the East. It grows in abundance in the hilly portions of Burma and Pegu, whence Calcutta is supplied for the purposes of naval architecture. But the Burmese and Tenasserim varieties are of inferior quality being grown on low lands. The best is produced on the mountainous parts of Malabar, the Coromandel coast near the river Godavery, the forests of Rangoon, Moulmein, and Pegu; the largest quantities at the latter place. The Indian forests of teak were in 1856 reported to have been overworked; **BUILDER Journal**, xiv, 168. It is light brown in colour, a porous and quick-growing wood, and is saturated in the fresh state with an aromatic oily substance. It contains a large quantity of siliceous matter which is destructive to tools. It resists the attacks of worm and white ant, but is liable to injury from barnacles. It shrinks but little in width; in length, it was found in the Mauritius to be three-quarters of an inch in 38 ft. It grows to sometimes 50 ft. long and 20 ins. diameter. In 1851 planks from Rangoon 3 ft. 6 ins. wide were exhibited in London (*Jurors' Reports*, 1851, p. 137). This timber rivals the oak for ship-building; ships constructed of it have sustained service longer than any other. It is classed 5 in the eight timbers at Lloyd's. **GREENHEART.**

The weight and specific gravity vary greatly, from .583 to 1.056; for practical purposes it may be taken from .600 to .750, in trees varying from 5 ft. 6 ins. to 9 ft. girth. **LASLETT**, *Timber*, etc., 8vo., 1875, p. 119, gives the mean strength of the teak from Tenasserim forests as 233 lbs. per square inch; the Moulmein teak as only 220 lbs. The tensile strength was nearly equal to six tons for cohesion, or about 3,301 lbs. per square inch. The crushing force was about 2½ tons per sq. inch of base (in one instance 12,011 lbs. or five tons was obtained). Teak timber is sorted into A, B, and C classes in the London market, according to dimensions, not quality. Thirty-six specimens from the forests of Moulmein are described in *Jurors' Reports*, 1851, p. 137.

BASSIA, as hard and durable as teak.

BIGNONIA, used for same purposes as teak.

BRIEDELIA, little if at all inferior to teak.

BUTEA, hardly distinguishable from teak.

Ceylon teak, rather hard, fine, close grain, and somewhat heavy. 71.

EAST INDIA TEAK; see **TECTONA**.

MAYTOBEK of Tavoy, preferred to teak for bottoms of ships.

OLDFIELDIA Africana, African oak, sometimes called African teak.

African teak from the west coast, is valuable to shipbuilders.

Ome teak. Dark brown of Paughant jungle; third rate. 71.

PALAN, of Cuddapah, hardly distinguishable from teak.

PAUL TEAK, of Travancore.

PEGU. Peinghee; near it, a great part of teak is procured, and exported from Rangoon.

PREMNA, Kolcuttay teak of Mysore.

SANTA MARIA TIMBER, South America, little inferior to teak.

SHOREA robusta, Saul or Sal, of India. In strength and tenacity it is considerably superior to the best teak.

A large quantity of teak is supplied from Java.

The roof designed by sir R. Smirke, 1830-32, of York cathedral after the fire of 1829, was executed in teak wood, the gift of the government, valued at £5,000. **FALCONER**, *Teak Forests of the Tenasserim Provinces*, 8vo., Calcutta, 1852. **BUILDING NEWS Journal**, 1857, iii, 19; v, 453, 467, by Wray, at **SOCIETY OF ARTS**. 1869, xvi, 84, *The Constructive Value of Teak*. **OLDRIEVE**, *Best method of maintaining the supply of Teak; price, size,*

and quality, 8vo., 1855. BUCHANAN, *Mysore*, 4to., 1807, i, 26; ii, 472, 123; Index. 1. 14. 71.

TECTONICUM; OPUS. A term applied to metal work.

TECTORES. The Roman word for plasterers as distinguished from ALBARI or whitewashers. DEALBATIO.

TECTORIUM OPUS. A thin coat of marble, sand, and lime, well worked. At the house of Mausolus, the plastering, or stucco, sparkled like glass; VITRUVIUS, ii, cap. 8. ALBARIUM. LORICA TESTACEA. 25.

TEDESCA; TEDESCH; *tedesque* from AL TEDESCO. La maniera architettonica che dal 1200 gl' Italiani tolsero ad imitare dai Germani; VASARI, *Vita*, 8vo., edit. Fir., 1846, i, 196; 122, 204. "Arabe tedeschi", a mixture of Moorish, Greek, or Roman, with the German Gothic; ELMES, *Lectures*, 8vo., 1821, p. 375. The intimate mixture in the example, *Illustrations*, Tomb, pl. 39, of the Classic and the Pointed style is obvious; the pinnacles, the crockets, the cusps of the arch, have all a general resemblance to similar works of the same period in England; but the form of the arch, the trusses, and many of the enrichments, bear the strongest marks of their classic origin. This incongruity of style characterises almost all the attempts of the Italians at designing *alla maniera tedesca*, and has greatly detracted from the elegance of many of their architectural and sculptural works, in which the execution of the details shows the power and taste of the artist. The figure was the work of Giovanni Pisano. "L'ordine Todesco" is named in a letter 1582 from Pellegrino, in GAYE, *Corteggio*, 8vo., 1840, iii, 446.

TEDESCA; MANIERA. A term applied to German art, writing of the amphitheatre of Pola, "perche elle sono di miglior maniera, e meglio intese, e tengo per certo che quel fusse un' altro architettura differente da questo, e per avventura fù Todesco: percioche le cornici del Coliseo o hanno al quanto della maniera Todesca"; SERLIO, *Architettura*, fol., Venice, 1663, lib. 3, p. 150. "Opera Thodesca"—quod Itali Teutonicum inventum sive Germanicum opus passim appellant; *idem*, lib. 5, p. 401. The palazzo Foscari at Venice is named by F. Sansovino as *nel gusto Todesco*.

TEDESCHI (V...), dying in 1644, G. P. Novelli was appointed architect to the city of Palermo, by the senate.

TEDESCO (GUGLIELMO); see INNSBRUCK (WILHELM VON), builder of the Campanile at Pisa.

TEDESCO (JACOPO), designed the church at Assisi; JACOPO.

TEDESCO or TODESCO (GIROLAMO), designed 19 June 1519 the fondaco dei Tedeschi at Venice, burnt in 1504 (P. LOMBARDO).

TEDRES; see THYSDRUM. The ancient name of EL JEM, in Tunis.

TEE. On the top of the TOPE (stupa or dagoba) at Sanchi is a flat space about 34 ft. diameter formerly surrounded by a stone railing, and in the centre of this once stood a feature known to Indian archaeologists as a "Tee", which is, with the rock-cut example at Ajunta, an early example. The lower part has the Buddhist rail, the upper part the conventional window, crowned by a lid of three slabs, and no doubt either was or simulated a relic casket. Generally it is, or was, surmounted by one or more discs representing the umbrellas of state; in modern times as many as nine. The only ancient wooden one is that in the cave at Karli; in stone and in painting there are thousands (p. 64). In the caves at Karli and Ajunta is the dagoba surmounted by the Tee. Three umbrellas are found in the caves, but a model of a dagoba (p. 126) has six discs; and in Behar, numerous models are found with seven, making with the base and fluted nine storeys, the conventional number for the towers in China. The *stupas*, or *chaityas*, of Nepal, are mound-like erections with an exaggerated form of the *tee*. This is in fact the most marked characteristic of the modern Thibetan dagoba, which in China is carried frequently to such an extent that the *stupa* becomes evanescent, and the *tee* changes into a nine or thirteen-storeyed tower (p. 303). The mound becomes a building called *Kosthakar* in which the dagoba (or shrine) is only the crowning ornament;—the four-faced *lingam* of Siva, or with four Buddhas, leading to the idea that a *lingam* is really a diminutive DAGOBA (p. 305). FERGÜSSON, *Indian, etc., Archi-*

ecture, 8vo., 1876. BARLOW, at ROYAL INST. OF BRIT. ARCHTS., 1859-60, p. 100.

TEE-CRAMP. A form of metal CRAMP, especially for wood-work, as in securing the bar of a sash to its frame.

TEE-HINGE. Another term for cross-garnets. See GARNET hinge.

TEE-JOINT. A wrought-iron hinge similar in form to the garnet, but having a longer neck admitting of the door opening better. The common garnets are "pressed"; the London Tee-joint hinge is wrought thicker; and the proper Tee-joint is stronger still.

TEENEH or TINEH; see PELUSIUM, the Sin of the Bible.

TEE-SQUARE. The well-known ruler made in the form of the letter T, consisting of a parallel blade and a head or stock having a rebate on each side, so that either side of it will slide on and against the board. The square is made of mahogany, pear, ebony, and is also ebony-edged; another has a steel blade for the use of engravers on wood. All these may be also made with a partly shifting head or stock for drawing parallel sloping lines. In Stanley's improved square, the head has only one rebate so that the set-square can pass over the head, the blade is indelectable, and the stock works on the centre of the edge of the board. "To every drawing-board belongs a separate part called a square —, by workmen is called a te square"; HALFPENNY, *Magnum in Parvo*, 4to., London, 1728, p. 2.

TEETH. Small square blocks in the recess of the internal angles of a cornice or string-course used in cornices of the Ionic order. DENTIL. An ornamental band in the cornice of some of the Roman orders, by some called ASSER. s. J. B. 4.

TEFFONT QUARRY; see TISBURY STONE.

TEFLIS; see TIFLIS, in Trans-caucasia.

TEGEA, in Arcadia, in the Peloponnesus. It was celebrated for its temples to Ceres and Proserpine, to the Paphian Venus, and to Apollo (superior to that at Bassæ), all three the works of CHRISOPHUS of Crete, B.C. 500; PAUSANIAS, *Descr. Gr.*, viii, 41. Also to Minerva Poliatia. SCOPAS of Paros, B.C. 390-349 assisted in rebuilding the Ionic temple of Athene Alea, after the fire in Olymp. 96, 2, B.C. 394, stated by PAUSANIAS, viii, 45, to have surpassed that at Olympia in sumptuousness. DODWELL, *Classical Tour*, 4to., 1819, ii, 419, in 1805 identified its site as west of the church of S. Nicholas, correctly as proved in the excavations 1878-79 by the Germans, explained in MITT. DEUT. ARCH. INST., v, 52-69. But its size, 153 ft. by 70 ft., does not deserve the encomiums of PAUSANIAS. It was peripteral Doric hexastyle having 13 columns on the side, which with the caps were only 25 ft. 10 ins. high. Corinthian columns above Ionic at this temple is referred to in GWILT, CHAMBERS, *Civil Architecture*, 8vo., 1825, ii, 293. The sculpture found is placed in the museum at Piali, at which town are the principal ruins. Some sculpture of the pediment carved by Scopas was 1886 deposited in the museum at Athens. A theatre, considered by Ross to be in the foundations of the ruined church of Paleo-Episkopi, and which may have been erected B.C. 175 by Antiochus IV. 23. 28.

TEGIMEN. Another Latin name for CIBORIUM.

TEGULA. The Latin name for the TILE whether of marble or earthenware. See IMBREX, woodcut. The roof of the temple to Zeus Olympius, at Olympia, was covered with slabs of Pentelic marble in the form of tiles, the invention of Byzes of Naxos.

TEHERAN. The modern capital of Persia. It is destitute of any architectural pretensions. The palace consists of a great number of buildings, courts, and gardens covering an extensive area, enclosed by a high wall. In 1868 there was a report of large alterations and of the extension of the town; BUILDING NEWS, 1868, xv, 279. R. C. M., *Tour in Persia*, 8vo., 1828, p. 141. KEPPEL, *Personal Narrative*, 8vo., 1827, ii, 129. PORTER, *Travels*, 4to., 1821-2. COSTE, *Monuments Modernes de Perse*, fol., Paris, 1867, 4 pl. HOMMAIRE DE HELLE, *Voyage en Turquie et en Perse*, fol., Paris, 1853-59; throne, pl. 57-64. FLANDIN, *Voyage en Perse*, fol., Paris, 1844, pl. 24-32; i, 228; ii, 428-34. 14. 50. 96.

TEHUACAN, in Puebla, in Mexico. Under the Aztecs, this place was regarded as one of their most sacred spots. A *teocalla* or pyramidal erection with a flight of steps up to the platform, is shown in GAILHABAUD, *Momuments*, 4to., Paris, 1850, iv.

At TEHUANTEPEC, in Oaxaca, a circular pyramid is formed of 8 drums lessening in height. At San Cristoval Teapantepec is a square tower of four stories with an inclined plane on one face from terrace to terrace.

TEINTE. The French term for TNT, and formerly so written in English.

TEIOS; see TEOS, in Caria.

TEISS (CASPAR), held the appointment of architect to the elector Joachim of Brandenburg, and designed the schloss Grünewalden. A lecture on this forgotten architect of repute was given by von Raumer in 1842.

TEL. The Arabic for a mound, and to which various names have been added. At Ak-terin, near Aleppo, is an artificial mound nearly half a mile in circumference, and about 150 ft. high, having a wall of huge stones around it, 12 or 15 ft. high. There is a vast number of these "tells" throughout northern Syria and Mesopotamia, as many as twenty being seen at a time. MYERS, *Remains of Lost Empires*, 8vo., 1875, p. 71: and the artificial tell of Alizh, near Samarah, probably the tumulus raised by the Roman army in 363, on the burning of the body of the emperor Julian who died here retreating before the Persians (p. 164).

TELAMONES (Gr. *τελαμώνες*). This term is mentioned by VITRUVIUS, vi, 10, as the Roman equivalent to ATLANTES for male figures serving to sustain beams or cornices. In the tepidarium of the baths at Pompeii they were two feet high, formed in terra-cotta in high relief, placed against the wall between niches, incrustated with the finest marble stucco, and painted; *Pompeii*, i, 160. Others occur in casa della camera Nera, at Rome. CARYATIDES are figures of women. CORA or CORE. In the grotta de' Pompei, or del Tifone at Tarquinii, are depicted two winged human male bodies terminating in serpents instead of legs, most spirited and grand, the hands are uplifted as if supporting the flat ceiling of the tomb: DENNIS, *Etruria*, 8vo., London, 1848, i, 304. Others have been found beneath the Theseium at Athens; MURE, *Greece*, 8vo., Edinburgh, 1842, ii, 317. Two colossal statues of Egyptian style, in red granite, found at Hadrian's villa, serve as Atlantes to the massive entablature, by M. A. Simonetti (*temp.* Pius VI, 1774-1800), for the sala della Croce Greca in the museum at the Vatican; *Museo Pio Clementino*, ii, pl. 18, engraved by Visconti. At the palazzo Pozzi, at Milan, by Leone Leoni of Arezzo, colossal statues support the front, to which the name of *Omenoni*, or big men, has been given; *Handbook to North Italy*, 1842, p. 201. At the villa Albani, the figure was sculptured by Crito with Nicolaus of Athens; WINCKELMANN, *Opp.*, vi, 203, considers they flourished about the time of Cicero (B.C. 106-43). A representation of a temple on which is an order of Telamones, is given from a medal, in HAVERCAMP, *Nummo. Reg. Christ.*, fol., 1742, pl. 19. The attic order of the Pantheon at Rome was originally decorated with Telamones. The attic or superior order in the interior of the temple of Jupiter at Agrigentum was supported by Telamones or Titans, forming a magnificent decoration to the cella; STUART, *Antiq. of Athens*, Supp. Vol., fol., 1830, iv, 7.

A group of standing figures carrying a large romanesque capital in the cloister at S. Bertrand de Comminges, Languedoc; also at Nivernois; and two male figures to portal of the church at Germigny, are examples in the mediæval period.

TEL BASTA (ancient Pasht and Bubastis), or Tel Barte, near Zagazig, a site east of Cairo in Egypt, in which country it was one of the most ancient cities, from XVIII to XXII dynasty, when its first king Sheshonk I (Shishak) fixed his seat in his native city; it declined in XXVI dynasty. The temple, 500 ft. long, of the finest red granite, is entirely destroyed. The account by HERODOTUS is given in *Handbook for Egypt*, 1888, from RAWLINSON'S edit. Royal Archaeological Inst. Journal, 1888, p. 93.

ARCH. PUB. SOC.

TELEKLES of Samos, about B.C. 580, was a son of RHÆCUS, and had a brother Theodoros (DIODORUS S., i, 98). Another Telekles had a son Theodoros (PAUSANIAS, 8, 14; 5, 10; 38, 3; and HERODOTUS, 3, 41). SILLIG, *Dict. of Artists of Antiq.*, 8vo., 1836.

TELEKOUFONON. The registered improved; given about 1859 by Whishaw to the whistle mouthpiece of a speaking-tube. It is made of ivory, fancy woods, or metal, with an indicator attached, by means of which a speaker, on first blowing through it, readily attracts attention to the one of two or more tubes in a room. It also announces the fact that a person is waiting at the other end to forward a message.

TEL EL AMARNA. It represents the site of "the heretic king" Khu-n-aten of the XVIII dynasty; it was built during his reign, and deserted soon after his death, on the return of the Egyptian monarchs to the old worship of the Theban Amen; SAYCE, in *Proceedings of Society of Biblical Archaeology*, June 1888, p. 488. Grottoes and tombs there are of the time of Amenhotep IV. EGYPTIAN ARCHITECTURE.

TELESTERION, or temple of Ceres and Proserpine. A house of assembly at Eleusis. It is the most famous of all the temples of the Greeks, and one in direct contrast to any other Greek temple that exists, being planned to accommodate a large concourse of people, and was the hall where the Eleusinian mysteries were celebrated. Rows of seats still remain in the building or cella, which was 170 ft. square exclusive of the portico; built on the site of a steep hill, with the angles to the cardinal points. The date of its erection and its architect are unknown, but is after the burning of the original one by the Persians B.C. 484. The twelve-columned (6.2 ft. diam.) portico is perhaps the one designed by Phileus, about B.C. 300, as described by VITRUVIUS, vii, intro.; and is purely Greek in design and execution; Ictinus perhaps the designer, Corœbus and Metagenes carrying it out; Xenocles of Chalcargus roofed or domed or arched, or completed in some way, the top, forming an *opæion*. The columns 4 ft. 2 ins. diameter, the upper and lower ranges, and other works, as lately excavated, may be late Roman works in rebuilding. STRABO, ix, c. 1. PAUSANIAS (1 cent. A.D.), *Attica*, i, c. 38. PLUTARCH, *Life of Pericles*. HERODOTUS, ix. LEWIS, *Notes in Greece*, 1881 and 1884, at Royal Institute of British Architects, *Transactions*, 1887, p. 85-90, and plate; and *Proceedings*, p. 172. Its outline was ascertained by the SOCIETY OF DILETTANTI, *Antiq. of Ionia*, fol., 1797, ii, pl. 18-9; also *Uned. Antiq. of Attica*, fol., 1817. The edifice has been restored by FERGUSSON; also by FALKENER, *Classical Museum*, 8vo., 1851, i, 173. ELEUSIS.

TEL ET TMEI, on the site of Thmuis, near Mansoorah, in Lower Egypt. A red granite monolith, outside, 21 ft. 9 ins. high, 13 ft. broad, 11 ft. 7 ins. deep; inside, 19 ft. 3 ins. high, 8 ft. broad, and 8 ft. 3 ins. deep. It shows the prenomens of Amasis. These dimensions differ somewhat from those given by ANNESLEY, lord VALENTIA, *Travels*, 4to., London, 1809, iii, 430, who was the first to notice the monolith; and from BURTON, *Excerpta Hieroglyphica*, fol., Cairo, 1825-37. It stands on a pedestal 6½ ft. high, which is on three layers of stone, making a total height of 34 ft. 7 ins. including two of the three layers. The top is elevated to a point in the middle, 11½ ins. high. An elevation in *Description de l'Egypte*, v, pl. 29. THE BRITISH MUSEUM, *Egyptian Antiquities*, 8vo., London, 1832, i, 193-6. 28.

TELFORD (THOMAS), born 9 August 1757 in Westerkirk, in Dumfriesshire, was apprenticed to a stonemason in Langholm. 1780 he removed to Edinburgh, 1782 to London, and was employed at Somerset house, 1784 at Portsmouth by S. Wyatt; and 1787 at Shrewsbury, where 1787-93 he designed the gaol, made alterations at Shrewsbury castle for sir W. Pulteney; was appointed county surveyor, designing some forty small bridges, etc.; also Mountford bridge, over the river Severn, having elliptic arches, one of 58 ft. and two of 55 ft. span; 1795-6 the iron bridge at Buildwas, a flat arch of 130 ft. span; 1792-96 rebuilt the church at Bridgenorth; and designed the small

churches at Madeley and Dawley, near Coalbrook dale, Shropshire, all three given in BREWSTER, *Edinburgh Encycl.*, pl. 176: 1795-1805 the Ellesmere canal, 103 miles long, in which is the aqueduct bridge of ten arches each 40 ft. span, over the Chirk; and the pont y Cysyllte over the Dee: 1773-1823 the Caledonian canal; many other canals in Sweden also; with a tunnel at Harecastle, 14 ft. wide by 16 ft. high. The Highland roads, etc., with about 1,200 bridges, etc., several Highland churches and manse under a grant of 1823. 1805-6 the bridge near Kirkcudbright, of one arch 112 ft. span. The Dean bridge at Edinburgh; Path-head bridge near that city, of five arches of 50 ft. span; 1823-26 Tewkesbury bridge, an iron arch of 170 ft. span and 17 ft. rise; 1826-8 Over bridge at Gloucester, of one arch 150 ft. span; 1833-5 the former old Broomielaw now Glasgow bridge, in Glasgow, having seven arches; and 1819-25, the Menai iron suspension bridge. He wrote the articles *Architecture*, *Bridge*, *Civil Architecture*, and *Inland Navigation*, for BREWSTER'S *Edinburgh Encyclopædia*, 4to., 1830. In 1830 he was president of the Institute of Civil Engineers, to whom he left his papers and a legacy. He died September 2, 1834, aged 77, and was buried in Westminster abbey; a statue was carved by E. H. Bailey, R.A., 1839.

RICKMAN, *Life and Labours of T. Telford*, by himself, 4to., 2 vols., 83 pl., 1838, in which is a portrait of him. PARNELL, *Treatise on Roads; plans, etc., used by T. T. on the Holyhead Roads*, 8vo., 1833; 2nd edition, 1838. SMILES, *Life; with introductory history of Roads and travelling in Great Britain*, 8vo., 1867. Preface to *Transactions of Institution of Civil Engineers*. CHAMBERS, *Scottish Biographical Dictionary*.

TELLIER or TELLIER (GUILLAUME LE), a native of Fontaines le pin, near Falaise, was from 1436 master of the works at the church at Caudebec (begun 1426) for thirty years at least. He raised the tower (?) and turrets and the whole height of the nave, built the choir and chapels, and the pendant boss of the chapel of the Virgin, where he was buried. He died 1 Sept. 1484, and bequeathed 7 sols 6 deniers of rents to the church. A facsimile of the epitaph, with effigy and the attributes of his profession and plan of the church, is given in DE CAUMONT, *Abécédair*, 8vo., Caen, 1850, p. 387; and in BULLER *Journal*, 1888, liv, 84. Views in *idem*, 1852, x, 770. INKERSLEY, *Romanesque, etc., in France*, 8vo., 1850, states that the west front, the tower, and other portions of the exterior date from 1517.

TELLER. The term given to every tree girdling less than 6 ins. under the bark. They are worth 1s. or 2s. each according to size and quality. They are counted in fives as arrived at, a mark being made in the field-book for each tree so girdling.

TELLIER (N... le), flourished about 1750 at Paris, where he designed the interior of the monastery of S. Martin des Champs. 68.

TELLING-ROOM. In the banks of Scotland the cashier is known as a "teller". The "telling-room" is the room in which he performs his duties, that is, where the public is served over the counter. That of the new city of Glasgow bank, at Edinburgh, is about 50 ft. by 35 ft.

TELLURIC CEMENT. A preparation for covering steam boilers, piping, etc., to prevent loss of heat, thus giving more steam, with less labour, saving in fuel, less wear and tear; three boilers covered doing the work of four uncovered.

TELMISSUS or TELMESSUS. An ancient town in Caria, now represented by Macri, Makri or Makry, or by Myes or Meis, in Anadolio, in Asiatic Turkey. The town was renowned in antiquity for the art of divination. The principal remains are a large plain theatre 254 ft. diameter, in fair preservation, the stones used being about 9 ft. long, 3 ft. wide, and 2 ft. thick. Three out of five immense portals are mentioned as still standing, the transverse stone on the jambs being 10 ft. 7 ins. long. An interesting series of tombs, sarcophagi, etc., of several dates. A number of caves along the coast partly built and partly cut in the rock. The name of "Hermolycus" was found at the back of a pilaster cap. CHOISEUL GOUFFIER, *Voy. Pitt. de la Grèce*, 4 vols., fol.,

1842; i, pl. 65-72, gives tombs and theatre. ALLAN, *Pict. Tour in Medit.*, fol., 1843, p. 44. BEAUFORT, *Karamania*, 8vo., 1817. LEAKE, *Asia Minor*, 8vo., 1824, p. 180; 320-1. SOCIETY OF DILETTANTI, *Ionian Antiquities*, fol., 1797, ii, pl. 59. TEXIER, *Asie Mineure*, fol., Paris, 1839-49. CLARKE, *Travels*, 4to., 1812, 2, i, 240, for bevelled stones. GAILHABAUD, *Monumens*, 4to., Paris, 1842-52, i, tomb. WALPOLE, *Travels*, 4to., 1820, p. 251. SPRATT AND FORBES, *Travels in Lycia*, 8vo., 1847, settled the site: CIVIL ENGINEER, ETC., *Journal*, 1847, x, 34. 2. 23. 25. 50.

TELMO (SAN); see ORENSE, in Spain.

TELONIUM. The custom house of the ancient Romans. One was discovered at Pompeii before 1832.

TEMANZA (TOMMASO), born 1705, at Venice, was the son of an architect, and nephew of G. Scalfarotti. In mathematics he was a pupil of G. Poleni at Padua, and of padre N. Comini. He was appointed one of the assistants in the commission of engineers, and 1742 chief of that body. He designed the church of Sta. Maria Maddalena (Ionic), given in CICCONARA, *Venezia*, fol., 1838-40, ii, 52; the rotunda at Piazzola for the Contarini family; and the bridge at Dolo, near Padua, over the river Brenta; and 1748 restored the façade of Sta. Margherita at Padua. He wrote *Dell' antico corso de' Fiumi in Padova e suoi contorni*; a *Plan of Venice in xix cent.*; *Vite de' più eccellenti Architetti e Scultori Veneziani*, 4to., Ven., 1778; *Antichità di Rimini*, fol., 1741; and *degl' archi e delle volte, etc.*, which was first edited in 1811. G. A. Selva studied under him. He died June 14, 1789, aged 84, and was buried in the church of the Maddalena. A portrait is in GAMBA, *Gall. dei Litt.*, etc., 8vo., Venice, 1822-24. COMOLLI, *Bibl. Storia Critica dell' Arch. Civile*, 4to., Rome, 1788-92. ROSSETTI, *Padova*, 12mo., 1780, p. 240, 372. 14. 68. 78.

TEMENOS. A Greek term for a piece of land cut or marked off from other lands. Also cut off from common uses and dedicated; the same as the Latin *TEMPULUM*. A curious Greek Doric temenos, or enclosure colonnade, at the temple at Kangovar, is given in TEXIER, *Arménie*, fol., 1842-52, i, 66. The columns are 1.450 diam. at top, with a small ovolo molding between the usual large ovolo and abacus: the total height is about 13.80. 78.

TEMESVÁR (ancient Lízisis and Thybiseus). The capital of the province of the same name in Hungary. A royal free city and fortress, situated at the confluence of the rivers Temes and Bega. The buildings date from 1716-8 when prince Eugene took the place from the Turks and rebuilt it. It is the seat of the Roman Catholic bishop of Csanad, or Chonad, who has a fine Gothic cathedral dedicated to S. George; and of the Greek bishop of Temeswar, who has also a cathedral. There are also two or three other churches, some having been mosques; courts of justice, the old stone castle of John Hunyady, the elegant residence of the bishop of Csanad, the remarkably fine building in which the chapter resides, the house of the commander of the military frontier, on the parade, the large and handsome county hall in the great square, the great barracks, military and civil hospitals, fine synagogue (Byzantine), and the Rascian town hall, in which is the theatre and assembly rooms. There are three gates each leading to a suburb. The Vienna gate leads to Michala, occupied by Wallachians having their own churches: the Peterwarden gate leads to Josephstadt, the summer residences of the wealthy Germans, and through it passes the fine Bega canal: and the Transylvanian gate leads to the *fabriken vorstadt*; the warehouses were broken up in 1738, but the Turks still reside therein. 14. 26. 28. 96. CHONAD in 50.

TEMPELMAN (OLAF SAMUEL), became hofbaumeister and professor at the academy at Stockholm. He died 1816. 68.

TEMPER. A quality of a material. That of steel greatly depends on the quantity of carbon there is in the steel, and this can only be arrived at by practice. Each one-tenth of carbon greatly affects its tenacity, whilst silicon in very much smaller proportions likewise sensibly affects it.

TEMPERA. The most ancient of all the modes of painting; common among the Egyptians, and from them doubtless brought into use among the Greeks, to whom the tempera paintings at

Pompeii are imputed. VASARI, *Vite*, Intro., 8vo., 1846, i, 161, describes the Greek medium and manner of applying it, as afterwards learnt by the Italians, thus "rosso di novo, yolk of egg, beaten up with some of the milky juice that issues from the tender twigs of the fig-tree. The colours ground in water are used with this mixture. Gum water for occasional glazings; for blue tints, size is better, as the yolk is apt to tinge the blue." The yolk beaten up in water with parchment size and a little drying oil mixed with the white. The usual kind of tempera looks very meagre when dry and becomes considerably lighter, and does not admit of repeated touchings. The yolk medium will receive high finish, and may be employed opaquely, or semi-transparently. This method of painting was used in some English cathedrals and churches. The so-called fresco paintings were only tempera on dry plaster. LATILLA, *On Fresco, etc.*, *Painting*, 8vo., 1842. DISTEMPER. "Duresco", an invention of about 1880, is said to be a washable tempera paint, a distemper treatment superior to oil paint in its effect at one half the cost. A new sort of tempera is described by GAMBIER PARRY, in *The Ministry of Fine Art*, 8vo., 1887.

TEMPERED. A term applied to such bricks as are easily cut and reduced to a required shape. Clay is tempered, *i.e.*, made fit for use in making bricks. 2.

TEMPIO. A town in Sardinia, the capital of Gallura. The cathedral and churches are not of much merit; but north-east of it is the Nuracu majori (NURHAG).

TEMPLA. Timbers in the roofs of Roman temples, which were placed on the *canteris*, or principal rafters, and correspond in use to the modern purlins. 1. 2.

TEMPLAR; THE KNIGHT. One of the religious military orders, originally crusaders about 1118, bound to entertain pilgrims and attend the sick and wounded. Their habit was white with the addition in 1146 of a cross of red cloth on the left shoulder or breast. The order was suppressed 1309 by Clement V, their property seized, and the order totally abolished 1312 by the council of Vienna. Edward III granted their lands generally to the Knights Hospitallers of S. JOHN OF JERUSALEM. The superior in England was styled "master of the Temple", the manors were called preceptories. Their first house in England was in Holborn, near Staple inn or Southampton street. In London, the church, "The Temple", was erected on the model of that of the Holy Sepulchre at Jerusalem, which was the general plan of their churches. It was consecrated 1185 by Heraclius, patriarch of Jerusalem, who had come to England for assistance after a great defeat. BILLINGS, *Architectural Illustrations, etc.*, 4to., 1838. ADDISON, *History of K. T., The Temple Church, and the Temple*, 4to., 1842. SMIRKE and ESSEX, *Illustrations*, in Weale's quarterly papers, 4to., 1845; RICHARDSON, *Monumental Effigies*, 4to., 1843; and *Sarcophagi, etc.*, 4to., 1845. BURGE, *T. Ch., account of its restoration and repairs*, 8vo., 1843.

A list of 53 preceptories of the Knights Hospitallers in England is given in WALLEN, *Little Maplestead Church*, 8vo., 1836, p. 206, of which 18 had belonged to the Templars, which with six others are noted in DUGDALE, 1830, vi, 818 (ROUND CHURCH). Those existing are:—Temple Bruer; and Aslackhy, both in Lincolnshire, and in ruins; Holy Sepulchre church at Cambridge, cons. 1101; S. Sepulchre's at Northampton, *cir.* 1120; the Temple church, London, cons. 1185. (The round church or S. John's at Little Maplestead was erected by the Knights Hospitallers, the parish being given to the order in 1186.) The foundations of the Templars' church at Dover were discovered about 1833. Temple Bruer is described in JEWITT, *Reliquary*, iii, 223; and ASSOCIATED SOCIETIES, *Reports and Papers*, 1874, lxxv. The Temple or church of the Holy Cross, at Bristol, was founded 1145. At Temple Balsall, Warwickshire, the hall still exists though enclosed in later brickwork; it is of considerable size, of timber, divided into nave and aisles by massive timber pillars. Newcastle, in Ireland; and Kilmainham, 71 acres of Phoenix park, Dublin, on south side of the river; WARBURTON, *Dublin*, 4to., 1818, p. 660. In Scotland, the Temple on the Southesk, before 1153 at Balan-

trodach. The Temple church, Midlothian, 17 ft. 7½ ins. wide, is given in four plates in Edinburgh Arch. Assoc. *Sketch Book*, fol., 1875-76.

Manual of the Knights of the Order of the Temple, transl. by H. LUCAS, 12mo., Liverpool, 1830. *Papers relating to the History, Privileges, and Possessions of the Scottish Knights Templars and their successors the Knights of S. John of Jerusalem*, 4to., 1828. *Houses granted*, 17 Edward II, RYMER, *Fœdera*, fol., xvii (at end), p. 15, 18, 22: 4579, Nos. 40, 48, 53; 4580, No. 43; 4581, No. 57. *Addit. MS.* 11,388, p. 136. *Hist. Account of the K. T. and their possessions in Fife*, in LEIGHTON AND SWAN, *Fife*, 4to., Glasgow, 1840, iii, 251-60. In Scotland, in LAURIE, *History of Freemasonry*, 8vo., Edinb., 1859, p. 75. *Notitiae Templariæ*, of various countries, in Freemasons' Quarterly Review, 8vo., 1837-45. DUGDALE, *Monasticon*, fol., 1830, vi, 818, etc. TANNER, *Notitia Monasticon*, fol., Cambridge, 1744, p. 307-10; 1787, 3rd edition. CAMDEN SOCIETY, *K. H.'s in England*, edited by Larking, 8vo., London, 1857.

Among the churches noticed in other countries are:—

- 1204-8 Segovia. GAILHABAUD, *L'Arch. du Vme*, i, of 12 sides with model of Holy Sep. in middle. Street, Spain, with plan, 184. 28.
- 1386 Leça do Balio, between Braga and Oporto; curious. Pombal, in Portugal; door of church and castle, TAYLOR, *Voy. en Espagne*. Pisa; Santo Sepolcro; round or octangular. Brindisi; SIMPSON, *Meeting the Sun*, 81. Metz. Le Puy. At Luz; Mellin, *Pyrenées*, fol., 1826-30, pl. 26.
- xii cent. Lectudy in Finisterre; MACQUOID, *Thro' Brittany*, 1877, p. 279. Boppard; Bacharach; Koblenz; Hundeshagen. Lanbader, near S. Pol de Leon; beautiful rood-loft; *Handbook to France*, 1877, i, 144.
- xii cent. Montsaunius, perhaps in *Monumens Historiques*, and drawn by V. M. C. RUPPRICH-ROBERT.
- Ramersdorf; Chapel, GAILHABAUD, *L'Arch. du Vme*, i.
- xiii c. Salon, France. 28. 50. La Vera Cruz. Ste. Vaubourg, near Rouen, existed until 1789.
- Toro; Collegiate church; Zamora, church of the Magdalen; Manzanara church, near Aviles; are stated to be fine specimens of Templar architecture in Spain; QUARTERLY REVIEW, 1846, vol. 77, p. 513.

Templars' houses are mentioned, as:—

- A building called "The Temple", about half a mile south of Stroud church, Kent, on the Medway.
- At Montreux; TAYLOR AND NODIER, *Languedoc*, i, pt. 2, after p. 66, s. v. Rodez.
- Domart in Ponthieu; ditto, *Picardy*, s. v. Abbeville, i.
- Clousayes; old château; ditto, *Dauphiné*.
- Louviers; ditto, *Normandy*, i, p. 1.
- xii or xiii Cologne; repaired 1840.
- 1150 Paris; Palais du Temple; the palace of the grand prior repaired 1825 *cir.*, at a cost of 500,000 fr.
- 1200 Paris; Le Temple, rue de la Corderie; used as a prison. Great part destroyed and built upon.
- xv. Ypres; House of the Templars; in Architectural Association, *Sketch Book* for 1882. *Illustrations*, s. v. Façade.

Besides Torpichen in Fife, and in Perthshire, they had two or more houses in the royal burghs and most towns, distinguished by the cross of S. John on top of the chimneys and in front. At Edinburgh, and at S. Andrew's (12), Cupar, two with pigeon houses, Crail, Aberdour, Strathmiglo, Danfermline, Kinghorn, most having excellent gardens. At Linlithgow, the town house is given in Edinburgh Arch. Assoc., *Sketch Book*, 1878-79, three plates. TILT YARD or List.

TEMPLATE. An improper orthography for TEMPLET.

TEMPLE. A building set apart for the services of religious worship, especially the Jewish, and those which were dedicated to the heathen deities of Egypt, Greece, and Rome. The name is not unfrequently applied to Christian sanctuaries, for example, the Temple church, London; and sometimes by a branch of the dissenting congregations. In more modern times (*cir.* 1760) the name was given to a shelter in extensive shrubberies.

The Egyptian temple was not a place of public worship but an edifice erected by a king in honour of some divinity, some-

times of a triad of divinities, to whom he wished to pay special homage, either in return for benefits conferred, or in the hope of future favours. It was built of stone, the enclosure or *temenos* (planted with trees) being surrounded by a high and massive crude brick wall. Near each one was a lake. Under the name herein of the town or other place a description of each temple is given. The following descriptions give an idea of the arrangements most usual in Egyptian temples of the middle and Ptolemaic periods.

1. In one face of the wall was a pylon or gateway only, beyond it a *dromos* or avenue of sphinxes, leading to the portico or to another pylon, a second row of sphinxes, a pylon, and a third row, leading up to the portico or pronaos which was in front of the *naos* containing the *sekos* or sanctuary, often isolated.

2. The avenue might be without sphinxes, then a portico; leading to a hall of assembly supported by columns; then to a *prosekos*, a transverse anteroom, a sort of transept; beyond it a central *sekos* or adytum, with a chamber or adytum on each side. These smaller temples expanded in importance, as follows.

3. A pylon, avenue of sphinxes, at the end of which were a pair of obelisks; propylon or pyramidal towers of the propylæum; the open propylæum, area, or vestibule, with a colonnade on either side; leading to a pair of statues of the king; inner propylons or towers, with staircases leading to the top; an inner propylæum or vestibule surrounded with a colonnade, the further one forming a sort of anteroom or portico, to the hall of assembly, the roof supported by columns, leading to a transept out of which is the central and side adyta.

4. In another sort, the avenue is preceded by a small raised hypethral building of columns, the ascent to which is by steps from the dromos; the remainder as the last described, as far as the inner hall, which has several small chambers on the two sides, then the transept with a small chamber at each end, which leads to the *naos*, having small chambers on the three sides, and in the middle an isolated adytum in which is a pedestal for the sacred ark of the deity. All behind the portico or pronaos is called the *naos*, which includes the *sekos* within it, and answers to the Greek cella.

28. *Rock-cut temples*, at ABDO SIMBEL or Ipsamboul; and others.

The Greek and Roman temples may be taken together. The precepts of design are given in VITRUVIUS. *ÆDES*; a sacred house not consecrated. *ÆDICULA*. *SACELLUM*. *TEMPLUM*; a consecrated house. *FANUM*. *DELUBRUM*. It is stated that a temple is not referred to throughout HOMER. A small temple of blocks of stone, no columns, occurs at Marmarion. One of three walls only, enclosing altar, at Gabii (STARKE, 224). The most ancient known temple is at Olympia. Temples generally faced the west, though sometimes placed facing a river. *ORIENTATION*. A temple built round the original one; as the Parthenon; and at Mantinea, for Hadrian. *Double temples*; as Zeus and Hera at Olympia by Libon; Minerva Polias at Athens. *Two story temple* at Sparta (DALY, *Revue Gén.*, xvi, 72). Temples of the Parthians were destroyed (GIBBON, *Decline*, i, 260); in Greece by Xerxes (i, 259); by Theodosius (iii, 291; 390). That of Venus at Carthage was converted 389 into a Christian church; as was the Pantheon at Rome by pope Boniface IV.

The different arrangement of Greek and Roman temples (*PORTICO*) is as follows: IN *ANTIS*, having two columns between pilasters projecting from the cella walls: rare in Roman work. *PROSTYLE*, having four columns in front. *AMPHI-PROSTYLE*, or double prostyle, ditto, and four in rear. *PERIPTERAL*, having six columns in front and rear and 11 on the flanks (including the angle ones), and were placed so far from the cella as to afford space for a walk between them: not often in Roman work. *PSEUDO-PERIPTERAL*, not having a walk round the cella, but the columns affixed to the wall, thus enlarging the cella. *DIPTERAL*, having eight columns in front and in rear, having two ranks of columns round the cella. *PSEUDO-DIPTERAL*, having eight columns in front and in rear and 15 on the sides (including the angle ones), the walls of the cella being opposite the

second column from the centre on each side. It had a pronaos and a posticum. The invention of Hermogenes, as was also the octastyle. *HYPÆTHRAL*, being uncovered in the central portion, or part of it, or lighted from a high side-light, or from an end window. The interior has two orders of columns at some distance from the walls. The *TUSCAN* temple, having wide inter-columniations. *MONOPTERAL*, having circular columns without a cella; and *PERIPTERAL*, circular with a cell and columns around it; this latter was considered peculiar to the Romans, but fine Greek examples have been found at Epidaurus and Olympia. *ROUND TEMPLE*.

Parts of a temple: *PORTICO*; *PRONAOS*; *CELLA*; *NAOS*; *ADYTUM*; *POSTICUM* in rear; *PTEROMATA* or wings; placed in an enclosure or *PERIBOLUS*, or surrounded by a plantation or *TEMENOS*. Frequently the *OPISTHODOMOS* of the principal temple was the public treasury of the state.

The *INTERCOLUMNIATIONS* of the Ionic and Corinthian orders:

Pycnostyle, 1½ diam. apart.	In the Doric order:
Systyle, 2 " "	Systyle monotriglyph = 1½ diam.
Eustyle, 2½ " "	Diastyle { to admit of a triglyph
Diastyle, 3½ " "	Diastyle { coming over the centre
Areostyle, 4 " "	Areostyle { of a column.

According to number of columns in the *PORTICO*, it was called *TETRASTYLE* with four columns; *HEXASTYLE* with six columns; *OCTASTYLE* with eight columns; *DECASTYLE* with ten columns; *DODECASTYLE* with twelve columns. No octastyle dipteral, or decastyle dipteral temple exists. One temple has seven columns at the east end and six at the west end. In Greece and Magna Græcia, double the columns in front is exceeded by 1 on side at the Parthenon and Theseium; by 2 at Pestum, Agrigentum, and Bassæ; sometimes by 3, as at Phygaleia and Selinus. There are at Ægina 6 in front and 12 in flank; also in the Nemesis at Rhamnus, suggesting a higher antiquity and sanctity. *PROPORTION*.

The four renowned marble temples were: Diana at Ephesus (Ionic); Apollo at Diduma or Branchidæ (Ionic); Ceres and Proserpine at Eleusis (Doric); Olympæon at Athens (Corinthian). Other temples are: Juno at Samos (Ionic); Cybele at Sardes (Ionic); Artemis at Magnesia (Ionic); Bacchus at Teos (Ionic); Minerva at Priene (Ionic); Agrigentum (Doric); Selinus (Doric); Athens, Parthenon (Doric).

The following list comprises the given sizes of some of the largest temples. A more complete list is given in PENNY CYCLOPÆDIA.

LEAKE, <i>Asia Minor</i> , 8vo., 1824, p. 346-52.	FERGUSSON, in R. I. B. A., 1876-77, p. 86.	PENNY CYCLOP., 1842, p. 185
Ephesus - 425 230	342 163 octastyle dipteral	425 220
Samos - 346 189	360 178 decastyle	(360 166)
Branchidæ - 304 65	355 163 decastyle	—
Sardes - 251 144		
Magnesia - 198 105		
Teos - 122 64		
Priene - 122 63	—	(360 178)
Agrigentum - 358 172	360 166 astylar	369 182
Selinus - 358 164	358 165 octastyle	350 160
Athens, Olymp. - 354 171	354 171 decastyle	228 100
" Parthenon - 100		
Venus and Rome - —	—	350 116
Jupiter at - —	—	259 96

The temple of Apollo at Clarus is the largest in existence; LEAKE, *Asia Minor*, 352.

The temples are partly named in this work under their *dedications*, as well as described under the *places*.

VITRUVIUS; and translations by NEWTON and by GWILT. SMITH, *Dict. of Antiquities*. FERGUSSON, *History of Architecture*. GWILT, *Encyclopædia*, 1888, in Glossary. QUATREMÈRE DE QUINCY, *Dict. of Arch.* Many of the *ENCYCLOPÆDIAS*. *ETRUSCAN*, *GREEK*, and *ROMAN ARCHITECTURE*. 14.

Indian, etc., Temples. *INDIAN ARCHITECTURE*. *HINDOO ARCHITECTURE*. *MAHOMMEDAN ARCHITECTURE*. *MOSQUE*. *ROCK-CUT TEMPLE*. Destruction of Hindoo temples and sculpture about

1660 by order of Anrunzeb. VIMANA or shrine. MANTAPA or porch. CHOULTRY or pillared hall in an enclosure with one or more GOPURAS or gateways. KULLUS or ball.

Chinese temple. See CHINESE ARCHITECTURE. TAA.

Japanese temple. The *Revue Générale de l'Architecture* (4th series, vol. xiii), contains an article on the Buddhist Temples of Japan, by César Daly, from information obtained from Guérineau, late architect to the Japanese government, now in Chili. Pl. 1. A bird's-eye perspective, made by Guérineau, of an imaginary Buddhist temple of the first order, showing the general arrangement of the courts and buildings of such a temple. This is shown rather more fully in the plan of the Nikko Mausoleum, made by Mr. Josiah Conder to illustrate his paper read during session 1886, p. 185, in the R.I.B.A. TRANSACTIONS (also March 1878, *Notes on Japanese Architecture*). Pl. 2. A parallel of plans of Buddhist temples, according to their Japanese classification. Pl. 3. A front and a side elevation of a temple such as that shown in pl. 1. Pl. 4 and 5. Two illustrations in colours of a portico to a temple; and detail to a large scale; and pl. 6 of the decorated ceiling of such a temple; and other surface decorations. The "Canon of Proportions" which regulates the construction of these temples, and an account of the system of construction which, he states, is adopted with a view to neutralise the effect of earthquake shocks, has to be given. JAPANESE ARCHITECTURE.

Jewish temple. See SOLOMON; TEMPLE OF. SYNAGOGUE.

Mexican temple; see TEOCALLA. MEXICAN ARCHITECTURE.

TEMPLE (RICHARD), architect to the office of First Fruits for the province of Leinster, designed 1831 S. Mary church, Dublin; and the church at Monkstown, near Kingstown, LONDON, *Arch. Magazine*, 8vo, 1836, iii, 583. He was subscriber to MALTON, *London and Westminster*, 4to., 1792.

TEMPLE (RICHARD), first viscount Cobham; see PITT (T.).

TEMPLE (maître RAYMOND DU), mason; see RAYMOND.

TEMPLE MOLDS. The term is used in HOLMES, *Academy of Armory*, fol., Chester, 1688, iii, 394, for "face molds, end molds, sill molds, mullion molds", etc. (Fr. *molds*, for mouldings; *paneaux* for the simpler forms of stones; *paneaux de teste*, *paneaux de joint*, etc.). De L'ORME, p. 56, mentions the use of copper, wood, tin, and pasteboard as the materials of which such molds, or templets were made.

16.

TEMPLET, corrupted into TEMPLATE. (Fr. *calebre* ou *cherche*). The etymology is unknown. A mould or outline of the proposed work used in masonry and brickwork for the purpose of cutting or setting out the work. For accuracy in working, two templets should be used, one for moulding the end of the work, and a reverse for trying the face; sheet zinc, or copper, is the best material, for where wood is used, inaccuracy is often caused by the expansion and contraction of the templet. S. J. B.

The art of cutting templets in the construction of a roof, is explained in CIVIL ENGINEER, ETC., *Journal*, 1856, xix, 45-7; and in works on *Carpentry*. In mason's work, see ROY. INST. OF BRIT. ARCHITECTS, HARVEY, *Masonry for Architectural Students*, in *Transactions*, iv, new series, 1888, p. 43. BEDDING STONE; DRAWING; FORMA; LAZZARI (p. 466); LIDHOLT; LINTEL; MOULD; PATTERN; PLATE. TASSEL or torsel.

Templet was also the timber placed under a girder or any other timber, as in and previous to 1700; they were "laid in loam, a great preserver of timber for mortar eats and corrodes it"; MOXON, *Mechanick Exercises* (Bricklayer's Work), 4to., London, 1700, p. 26. "Lentils laid in piers for support of girders—and for the better disposing of the weight imposed on girders, lentils should always be firmly bedded on a sufficient number of short pieces of oak, laid across the walls, vulgarly called templets, which are of excellent use"; LANGLEY, *Builder's Assistant*, 8vo. (1738), 3rd edit., p. 149. Some architects make them a trifle thicker than the range of four courses of brickwork so as to be pinched by the weight to fasten them to the corbel. But they are apt to weaken a wall by decay. An iron corbel plate is now adopted to receive the ends of heavy beams.

ARCH. PUB. SOC.

Stone templets are now (1885) used, and supplied "cut to size, 3 ins. to 9 ins. thick." Stone templets under columns or stanchions have to be considered as to quality, and carefully calculated for the weight to be borne; this is considered in BRITISH ARCHITECT *Journal*, 1886, Oct., p. 321.

TEMPLUM. A FANUM, an *ÆDES* consecrated by the priests. POMERIUM. The augurs having marked out the spot for the temple, sanctified it by certain ceremonies, called *augurea sive inaugurationes*. Without these, a sacred house was not a temple, but was called *ædem*: *Templum enim post consecrationem inaugurabatur; ædes vero non item.* GELLIUS, lib. xiv. VARRO's words are, *Non omnes ædes sacras templa esse; sed illa tantum quæ sint augurio constituta.*

TEN. This number is called perfect, because it is the limit and close of our system of numeration; all the numbers beyond ten being only combinations of this and the included digits. EUSEBIUS, *Eccles. History*, in BOHN, "Ecclesiastical Library", note by CRUSE, 8vo., 1851. SEVEN. THREE.

TENACITY. The power of holding. The property of resisting fracture from the application of a tensile or stretching force. It is usually stated in England in terms of the number of tons or hundredweights required to tear a bar one inch square in sectional area. In France, Germany, and generally over the Continent the force or weight is expressed in kilogrammes (2.2046 lbs.), with the square centimètre as the unit of area (the centimètre = .3937 inch). In Russia, the units often employed to express the pressure and the sectional area are the atmosphere (about 15 lbs.) and the square inch respectively, .00635 × number of tons per square inch = number of kilogrammes per square centimètre. This quality of tenacity is possessed by wrought or malleable iron, and by steel, in a very marked degree, and according to the composition, the mode of its preparation, or its previous treatment, physical or mechanical, as by hammering, rolling, annealing, hardening in water or oil, etc. The tenacity of timber is much greater in the direction of the length of its fibres than in the transverse direction. By hammering, or by wire drawing, the tenacity of copper is nearly doubled; and that of lead, according to EYTELWEIN, more than quadrupled. The consolidation is produced chiefly at the surface, and hence a slight notch with a file will materially weaken a hard metallic rod. Tables of "the tenacity of materials" are given in most Hand, and Price, books, giving both the tenacity and the tearing loads. TEST. Prof. HENRY *On Testing Building Materials*, read before AMERICAN ASSOCIATION OF SCIENCE, given in CIVIL ENGINEER, ETC., *Journal*, 1855, xviii, 377. RESISTANCE. 14. 25.

The tenacity of material is often shown in old buildings, BILLINGS, *Durham County*, 4to., 1846, p. 12, notices the church at West Auckland, as one of many instances; another at Lancaster.

TENANT. See LANDLORD AND TENANT. TENURE.

TENARUS, quarries of; produce an intense and even coloured black marble, not so durable as the Egyptica antico, from Africa, introduced by the ancients. NERO ANTICO. BLACK MARBLE.

TENDER. The sum required by a proposed contractor or builder for carrying out a work according to plans and specifications, who usually goes carefully through the items in detail; the statement of this sum is often called a proposal or ESTIMATE. A trial on appeal of Lewis v. Brass supported the plaintiff in the question whether the acceptance of a builder's tender in writing amounted to a contract between the parties. BUILDING NEWS *Journal*, 1877, xxxiii, 605.

TENEMENT. A word employed in descriptions of real property. It is usually and popularly applied only to houses and buildings, but its original proper and legal meaning includes everything of a permanent nature that may be holden, whether corporeal or incorporeal. "Ende of sayd terme tenendmeytte sall leyffe"; i.e., fit for a tenant; in a state of repair; fit for occupation; 1483; SURTEES SOCIETY, *Finchale Priory*, 8vo., Newcastle, 1837, p. 96.

TEN FOOT ROD; see ROD.

TENGAUN or TENGAN; see HOPEA.

TENI (Gr. *This*). The supposed burial-place, with Abydos, of Osiris; EDWARDS, *Up the Nile*, 4to., 1877, ii, 687.

TENIA; see TENIA. BANDALET. LISTEL.

TENNANT. An old way of writing TENON.

TENNIS COURT (Lat. *sphaeristerium*; Fr. *jeu de paume*; Ger. *ball haus*). The game was very popular in XVII cent. Jan. 22, 1617, patent granted to Sir Tho. and Harry Cornwallis of the office of groom porter. They are to license 31 bowling alleys, 14 tennis courts, and 40 gaming houses in London and Westminster and their suburbs, and a bowling alley in every village within two miles of London; each to be kept by a trusty deputy, no cheating allowed, and to be closed on Sabbath days. Similar patent by queen Elizabeth. *Calendars*, 1611-18, p. 429. A general account and description of collegiate tennis courts is given in WILLIS and CLARK, *Architectural History, Cambridge*, 4to., 1886, iii, 567-75, plan 571. Of sixteen colleges nine had tennis courts, thirteen had bowling greens, and eight had both. Some of them date 1571-1606; 1564-1886; 1474-1822; 1600 at Eton college. There was one at Whitehall, and at Windsor, 1663-87. At Holyrood palace for James IV, burnt at end of XVIII cent. A tennis court for "close tennys" play, at Hampton Court; LAW, *Hampton Court*, 4to., 1885, p. 138; 364. At Woburn Abbey, by H. Holland; in ROBINSON, *Vitruvius Britannicus*, fol., 1833, p. 12, 15-6. At Brighton palace. The best known court is that in James street, Haymarket, dating from about 1635. A careful measured drawing with a good description of it, together with "Macon's Tennis Court at Paris", are in the T. Hardwick collection of drawings in the library of the Roy. Inst. of Brit. Architects. The best size is 40 ft. wide, 110 ft. long, and 30 ft. high; to be paved with Portland stone on dry arches; the lines and figures marked in it by inlaid unpolished black marble, for if painted or chalked it may require to be renewed every three or four games; the coved ceiling to be boarded; the walls to be plastered with plaster of Paris, the joints in the brickwork being left open for $\frac{3}{4}$ in. to bind in the plaster; the ceiling and all the timbers to be painted red, the curtains green, and the walls black; with other details.

SWITZER, *Ichographia Rustica*, 8vo., 1742. DE GARSIAULT, *Art du Peuvrier-Raquetier, et de la Paume*, in Descr. des Arts et Métiers, etc., fol., 1767. PENTHER, *Vierter theil—Baukunst*, fol., Augs., 1771, iv, pl. 86. JULIAN MARSHALL, *Annals of Tennis*, 4to., London, 1878. KRAFFT, *Plans, etc., Maisons de Paris*, fol., Paris (1802), one dating 1786, pl. 111. ILLUSTRATED LONDON NEWS, 1845, vi, 80. FIVES COURT. RACQUET COURT. PALLONE. 14.

TENON, written "Tennant" in 1632; JUPP, *Carpenters' Company*, 8vo., 1848, p. 296; and LANGLEY, *Masonry*, fol., London, 1736, pl. 372; MOXON, *Mechanick Exercises*, 4to., 1677. The insertion of the end of a piece of timber, as a cross-beam or floor-joint, into the side of a beam or girder, and through it, to prevent its drawing out. This practice is shown in books on carpentering, but of late years has been condemned, as it greatly weakens the main girder: and accidents have happened. BUILDING NEWS Journal, 1865, xii, 129, 206. BUILDER Journal, 1865. "The equalizing strength must be considered with respect to the quality, position, and substance of the stuff," as explained in MOXON, *Mechanick Exercises* (Joinery), 4to., London, 1677, in the case of fir and oak. The "shoulder of a tenon" is the transverse plane to the length of a piece of timber from which the tenon projects: it is often, but not always, at right angles to the length. NICHOLSON, *Diet. MALPAS, Builder's Pocket Book of Reference, roofing, flooring, etc.*, 18mo., 1852, p. 52. CHRISTY, *Joints made and used by Builders*, 8vo., 1882. MORTISE and TENON. CARDO. DOVE-TAIL TENON. TUSK TENON. 25.

TENON SAW. This saw derives its name from being used for cutting the shoulders of a tenon, that is for cutting across the fibres of the wood; the plate is thin, and teeth fine, but to prevent straining it is fitted with a strong rim of brass or steel on its back edge; the length is from 14 to 20 ins. S. J. B.

TENSILE STRENGTH. That power of resistance which bodies oppose to a separation of their parts when force is applied to tear asunder, in the direction of their lengths, the forces or particles of which they are composed. The "Tables of Cohesion" are generally computed to the tearing of the material, but calculations should never go beyond the excess of elasticity for fear of injuring the material. GWILT, *Encyc. of Arch.*, 1888, p. 437, etc. The subjects for consideration are the neutral axis, deflection, modulus of elasticity, and impact or collision. The mode of trying the direct tensile strength was formerly exhibited by appending weights to the substance till it was torn asunder. STRENGTH OF MATERIALS. The tensile strength of cast iron was put by TREDGOLD at 20 tons per square inch, but capt. BROWN found it 7.26 tons; by RENNIE, a mean of 8.14 tons; by BARLOW, theoretically at 10 tons; by HODGKINSON, of 7.4½ tons hot blast, and 7.14 cold blast. Seven tons is now taken as the ultimate tensile strength: good wrought iron at 20 tons for bars; best Belgian wrought iron 22 tons; mild steel 24 tons. 20 tons for plates unless Lowmoor or Staffordshire best best best.

TENSION. A force pulling or stretching a body, as a rod. The degree of stretching to which a material is strained by drawing it in the direction of its length. A cord or string gives an acuter or deeper sound as it is in a greater or less degree of tension, that is, more or less stretched or tightened. TEARING.

TENSION BAR or ROD. An iron rod applied to strengthen timber or metal framing, roofs, etc., by its tensile resistance, and applied under the beam. The Tension bar principle for an iron viaduct bridge 150 ft. clear span, is shown in CIVIL ENGINEER, etc., *Journal*, 1841, iv, 213 and plate. In its simple form it was put into execution in the foot bridge over the river Whitadder, Berwickshire, as shown in HANN and HOSKING, *Theory, etc., of Bridges*, 8vo., 1843-53, pt. 4; and CIVIL ENGINEER, etc., *Journal*, 1841, iv, 331, showing two spans of 60 ft., and one of 24 ft.; and 4 ft. in width. In 1821, R. Stevenson of Edinburgh designed a bridge for the river Almond (EDINBURGH PHIL. Journal, October 1821; and DREWRY, *On Suspension Bridges*, 8vo., 1832, p. 30). In 1833, one was erected over an arm of the lake of Geneva, of thirteen openings of 55 ft. span and 25 ft. width; two foot bridges of 138 and 81 ft. span over the river Ness at Inverness; at Hutton Mill over the river Whitadder, Berwickshire, by Mr. Jardine of Edinburgh, of three openings 50 ft. span: also over the Whitadder, at Abbey St. Bathans.

Mr. Smith applied tension-rods very successfully for supporting the floors of the Deanston cotton-mills. The principle had come into general use about 1840, and by it a beam was considered to be rendered perfectly rigid, and even forced into a slightly arched form; while from the lightness and compactness of the whole, it possessed many advantages over the other methods in which the same thing was accomplished. This was effected either in the depth of the timber beam, or below itself, an arrangement considered stronger and safer. The rod is useful in proportion to its distance from the beam (evidently within certain limits). The stay may be in the centre of the beam, or two stays in the length may be used, to form the bow. The respective size or sectional area of the rod and beam is regulated by the respective strength of the materials, as it is useless to apply a rod capable of sustaining double the tensile force that the beam can resist of crushing force, and vice versa; it is merely adding weight; WARR, *Dynamics*, 8vo., 1851, p. 259. By these systems, of above, within, and under, a beam, rafter, or purlin, which will barely support its own weight safely, may be made to carry a load of many tons without sensible deflection. There are also two sorts of these bars, 1, where their ends are strongly fixed independently of the girder, and 2, where the ends are fixed on the girder so that they bend with the girder as it gives way, and are thus unreliable. The application to a girder, by T. Cubitt, is shown in BUILDER Journal, 1848, vi, 329. BOW and STRING BRIDGE, or BOW STRING, or TENSION BRIDGE; LAVE'S TRUSS; these have the bow above the string, or tension-rod. GIRDER.

TENSION-RIB system was first suggested by Mr. E. A. Cowper, some years before 1861. For ordinary chains he proposed to substitute girders, constructed in the same curve in which the chains would dispose themselves when the loading was equable, and of such depth of section throughout as to contain within their limits every line of pressure possible under any distribution of the rolling load. It is explained in CIVIL ENGINEER, ETC., *Journal*, 1861, xxiv, 79-81. A tension girder, of wrought iron with skew-backs for brick arches, is stated to be stronger than a rivetted girder; to be thirty per cent. lighter; thirty per cent. cheaper; and in one length without joints; no thrust or deflection; by Henderson's patent, 1867.

A *Tension chain net* floor and roof, for spans of 500 ft., is described by W. B. Adams, in *BUILDER Journal*, 1852, x, 702.

TENTERHOOK. A small nail formed of an angle or L shape, both ends pointed, one for being driven into wood and the other for receiving cloth or other material, as in drying. Walker's patent rustless tenterhooks (1886) are fixed on hard wood lags so that they can be easily fixed in short lengths on either wood or iron tenters. The modern form is a piece of iron pointed at both ends with a shoulder in the middle of one side by which one end is driven into the timber flush.

TENTH CENTURY ARCHITECTURE in England. See SAXON ARCHITECTURE. LONG AND SHORT WORK.

TENTYRA and TENTYRIS, of the Greeks and Romans; the modern Dendera or Denderah. A ruined town of Upper Egypt, situated on the river Nile. The temple to Athor is magnificent and well preserved. Commenced by the last of the Ptolemies, Cleopatra and her son Ptolemy Cesarion, and with a royal oval of Nero (58-68), it was comparatively new when Theodosius abolished the ancient religion in 379. MARIETTE's general plans give the temple as 139 ft. by a total depth of 267 (almost a double square), of this the rear part is 115 ft. by 186 ft. The pylon of 6 columns is very fine; the hall is 139 ft. wide, or 121 ft. by 61 ft. inside, and has 24 Hathor-headed columns each 7.21 ft. diam. and 32 ft. high, or 46 ft. 9 ins. with plinths and abacus; the inner hall is 45 ft. 6 ins. square having 6 columns 5.35 ft. diam. The sanctuary is 18 ft. 9 ins. wide by 36 ft. 9 ins. deep. (WILKINSON, *Thebes*, etc., 8vo., 1835, p. 405; *Ancient Egypt*, 8vo., 1850, p. 54.) Roofs, staircases, and treasure-crypts are still perfect. The temple is surrounded by a wall of undried bricks, about 870 ft. square, 35 ft. high in parts and 15 ft. thick. The portico shows in the entablature projections and intervals in its upper division, bearing a striking resemblance to the arrangement of the Greek Doric frieze, somewhat tending to refute the idea of timber construction; GWILT, in CHAMBERS, *Civil Architecture*, edit. 1825, i, 37. HAMILTON, *Egyptiaca*, 4to. and fol., 1809, pt. i, 206-14, relates VISCONTI's views on the mythological table or zodiac, from Denon's drawings. It was carefully removed in 1822 to the Louvre at Paris. *Description de l'Egypte*, iii, pl. 4. DENON, *Voyage*, pl. 14. IRBY AND MANGLES, *Travels*, 8vo., 1823, p. 151. MARIETTE, *Dendérah*; *Desc. gén. du grand temple*, 4to. text, Paris, 1875; 5 vols., fol., plates, 1870-74. EDWARDS, *Up the Nile*, 4to., 1877, i, 178-197. A small temple to Isis, a mameisi, an isolated hypæthral temple, with a few other ruins still remain. 1. 11. 14. 25. 28. 50.

TENURE. All land in England is held mediately or immediately of the king; the land in the hands of any layman is held of some lord, to whom the holder or tenant owes some service. It is by doing this service that the tenant is entitled to hold the land: his duty is a service and the right of the lord is a seignory. The word tenure comprehends the notion of this duty and of this right, and also land in respect of which the duty is due. The land is a tenement. LANDLORD AND TENANT. COPYHOLD. MANOR. INCLOSURE COMMISSION. ENFRANCHISEMENT. LAND. LAND OWNER. LEASE.

A large collection of remarkable tenures and customs is printed in the *BUILDING AND ENGINEERING TIMES* for April, 1883, p. 102, 226. BLOUNT, *Tenures of Land and Customs of Manors*, edited by Hazlitt, 8vo., 1874; glossary, p. 411-46. 14.

TEOCALLA or House of God. A pyramidal structure peculiar to the ancient Mexicans; in a few cases some small arched rooms have been found, but in general they are solid. Teocalli are found in great numbers throughout the country. They are frequently of large dimensions, having platforms on their summits, sufficient for a small temple, which contained statues of deities, and in front the sacrificial stone or altar, convex on its upper surface so as to raise the chest of the human victim. The teocalla of Mexico is four-sided and formed in terraces; those of Yucatan are approached by an unbroken flight of steps. They have been seen at Palenque in Yucatan; at Santiago-Guatascos; Chichen-Itza; Cholula, near Mexico, the largest; Uxmal; Papantla; Mitla; Moche; Oajaca; Tehuacan; Tehuantepec; Teotihuacan; Tusapan; Tezcuco; Xochicalco, having two bas-reliefs; and S. Cristoval Teapantepec. A pyramid, stated to have been found in California, is described in *BUILDER Journal*, 1853, xi, 647. Besides the publications named s. v. MEXICAN ARCHITECTURE, are BULLOCK, *Mexico*, 8vo., 1825, i, 110; ii, 113. SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE. FERGUSSON, *Hist. of Arch.*, 8vo., 1865, ii, 764. SQUIER, *Incidents*, 8vo., 1877, p. 125.

TEOCIDES or THEOCIDES, not particularly eminent, wrote a treatise on *The Rules of Symmetry*. VITRUVIUS, vii, pref.

TEODOLI (GIROLAMO), born in 1677, of a noble Roman family, who devoting himself to architecture, designed at Rome, the church and convent of the nuns of SS. Pietro and Marcellino (a Greek cross); the Carmelite monastery and church of S. Maria di Montesanto o Regina Coeli, piazza del popolo; the church of SS. Coronati martiri; that of Vicovaro; the casa della Madonna de' Miracoli, on the Corso; and the theatre d' Argentino, of a horse-shoe shape (sometimes attributed to Frediani). It is given in MORELLI, *Imola*, fol., 1780. He submitted a design with twenty-one others for the façade of S. Giovanni Laterano. He selected young men as pupils, of whom G. Subleiras excelled; Joseph Bonomi another pupil practised in England. He died 1766 at Rome, aged 89. 3. 12. 68.

TEOS and TEIOS. An ancient city of Ionia, in Asia Minor, now called Budrun by the Turks. Considerable remains exist at Sighajik, which appears to be built on the site of one of the two ports of Teos; and the walls built of old stones. The "great and splendid" temple to Bacchus of the Ionic order is in ruins; the columns about 3 ft. 8 ins. diam. were without plinths and had angular capitals; the temple was about 64 ft. on the upper step, and was considered by LEAKE, *Asia Minor*, 8vo., 1824, p. 328, 350, to have been of the same size as that at Priene, having 11 columns on the flank. The sculptures in 1870 were in the British Museum. The reference in VITRUVIUS, iii, 2; iv, 3, is now considered not to apply to Hermogenes as its architect; but pref. vii he states that Hermogenes wrote on the "monopteral temple to Bacchus at Teos". It has been thought (*Unedited Antiquities*, pl. xiv, 69) that the temple at Aphrodisias was perhaps the temple to Bacchus referred to by VITRUVIUS. PULLAN and TEXIER, *Asia Minor*, fol., London, 1865, describes "the cella as 31.15 ft. by 19.85 ft. The order had been Corinthian of Greek character: the temple like most of those of Asia stood in an enclosure surrounded by columns." This passage is not very clear, perhaps some other words are omitted. PULLAN, *Photographs*, 1876. The theatre, about 285 ft. by 70 ft., has only one of the upper corridors perceptible and an indication of the scene; POCOCCO considers it to have been a naumachia; STUART, *Antiq. of Athens*, fol., 1830, iv, 35. CHANDLER, *Travels in Asia Minor*, 4to., 1775, 111-12. SOCIETY OF DILETTANTI, *Antiquities of Ionia*, fol., i, 1769-97; also iv, 1882. CHOISEUL GOUFFIER, *Voyage Pittoresque*, fol., Paris, 1782-1809, pl. 124. HAMILTON, *Researches*, 8vo., 1842, ii, p. 11. DALLAWAY, *Constantinople*, 4to., 1797, p. 265. LESUEUR, *Histoire, etc., de l'Arch.*, 8vo., Paris, 1879, vii, ch. xi, p. 406. 14. 23. 50.

TEOSOPOLI (DOMINIQUE); see TEOTOCOPULI (D.).
TEOTIHUACAN. A plateau near Tezcuco, in Mexico. It is remarkable for a teocalla, called Tonatiuh-Ytzagual, or

House of the Sun, 682 ft. wide, with a platform on its summit at a height of 121 ft. The other, called Mezli-Ytzagual, or House of the Moon, is smaller. Both are composed of stone pottery and cement, having obsidian and terra-cotta images. BULLOCK, *Mexico*, 12mo., 1825, 2nd edit., ii, 144, who refers to the description by Dr. OTEYZA. MEXICO.

TEOTOCOPULI, or Theotocopuli (DOMINGO), called "il Greco", from his Greek extraction, was born 1548 in Spain. He became a pupil of Titian. As architect he designed 1575 at Silos, the monastery and church of S. Domingo el Antiguo, his best work, which is decorated with paintings and sculpture by him; 1590 at Madrid, the church, retablo, and colegio de Donna Maria de Aragon; at Toledo, the casa del ayuntamiento; the church and retablo for the Dominicans; and 1609, the retablo of the hospital de Afuera; at Illescas, about 1600, the hospital and church nuestra senora de la Caridad for the Franciscans. He died in 1625, aged 77 (MILIZIA, says aged 80). Another work gives 1635, aged 67. 3. 5. 14. 65. 66. 68.

His son JORGE MANUEL succeeded him at the cathedral at Toledo, where under G. B. CRESCENCIO 1625-6 he built the cupola and lantern of the capilla mozarabe (MADRE DI DIOS); and 1628 the pieza Uamada del Ochavo, therein (see J. GOMEZ de Mora). 66.

TEPIDARIUM. The term used in the baths of the Romans for the copper for warm water; and also the warm-bath room. A fine example was discovered at Pompeii, lit at one end, and with the telamones frieze. It does not appear that the water of either the tepidarium or frigidarium was used for bathing, but as an easy means of keeping the rooms at the required temperature, and through which the bathers quietly quitted the caldarium. In the villa of Diomedes there was the room without water. *Pompeii*, 8vo., 1832, i, 152, 160, 184, 199; ii, 229. In the Baths of Diocletian it appears to have been a magnificent structure, octagonal, oblong, having a semicircle in each face, and the vault supported by rows of tall columns. 2. 25. 78.

TERAM. The term used in Ireland for the cut bracket at the end of a step.

TERAMO (Anc. Interamna Prætutiana). The capital of the province of Abruzzo Ulteriore I, in Southern Italy, situated above the junction of the rivers Tordino and Vezzola. There are remains of an amphitheatre, of temples, baths, and aqueducts. It is the see of a bishop. The Gothic cathedral dedicated to B. Vergine Assunta, of very early date and once remarkable, has been greatly modernised. The churches of S. Domenico and S. Francesco; and the palazzo Delfico, are noteworthy. 28. 50. 96.

TEREDO NAVALIS. A sort of PHOLAS, a sea worm, which attacks timber when submerged in the sea in some parts of the ocean, as in the gulf of Mexico, where it sometimes attains a length of 23 ins.; it is very troublesome in the harbour of Sebenico, in the Mediterranean. The head is armed with a casque or shell in the shape of an auger; it insinuates itself through an almost imperceptible hole, and while boring, follows the line of the fibre of the timber, the hole enlarging as the worm increases in size. This so-formed tube reaches to the surface of the water and is lined with a calcareous secretion. A number of them may be worked and yet no indications appear on the surface. The Georgia pitch pine; the Jarrah wood from Australia, EUCALYPTUS; and GREENHEART timber, are stated to be exempted, and the BASSIA comparatively free, from attack. Chemical processes have failed to protect timber, but Bethel's system was stated in 1850 to have afforded the most satisfactory results. Copper sheathing, or studding it closely with broad-headed nails, is stated to be the best protection. INSECT. TERMES. CIVIL ENGINEER, ETC., *Journal*, 1849, xii, 382, gives PATON, *Old Southern Pier-head*; and 1850, xiii, 19. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, vi, 54; ix, 23, 41-8; xviii, 435-40. BUILDING NEWS *Journal*, 1859, v, 669. DENT, in Cantor lecture at Society of Arts, *Journal*; and in BRITISH ARCHITECT *Journal*, 1887, Sept. 23, p. 238. ENCYCLO-

PEDIA BRITANNICA, ninth edition. *The Teredo and Terebrans, their ravages on timber*, read at CIVIL and MECHANICAL ENGINEERS' SOCIETY, by W. J. Brain, who explained the "Beer-ising" process; in *BUILDER Journal*, 1877, xxxv, 88.

TERGESTE; see TRIESTE, in Austria.

TERM. The following publications are in addition to the publications given s. v. Dictionary. PAPENDIEK, *Synopsis of Architecture*, etc., 8vo., 1820; 1826. HAMILTON, *Handbook of Terms used in Art and Sciences*, 12mo., 1825. PUGIN, *Glossary of Ecclesiastical Ornament*, fol., 1844; 1868; 1875. *Technical Nomenclature of Marine Steam Engines*, English and French, in MUDIE, *Architect, Engineer, etc., Journal*, 4to., 1843, iv, 114. BURN, *Technical Dictionary, French and English, of Naval and Military Terms*, 8vo., 1852. BUILDING NEWS *Journal*; *Terms in Building in Lancashire*, 1860, vi, 563. *BUILDER Journal, Vocabulary of Architectural Terms in eight languages*, 1864, xxii, p. 264, 300. RAMÉE, *Dict. Gén. des Termes d'Architecture*, etc., 8vo., Paris, 1868. FAIRHOLT, *Dictionary of Terms in Art*, 8vo. (1870). *BUILDER Journal, Technical Terms*, 1872, xxx, 365, 384, 410. CHABAT, *Dict. des Termes employés dans la Construction*, 2 vols., 8vo., Paris, 1875. LEE, *Glossary of Liturgical and Ecclesiastical Terms*, 8vo., 1876. *Dictionnaire de l'Académie des Beaux-Arts, contenant les mots qui appartiennent à l'histoire des Beaux-Arts*, etc., 5 vols. (A-Décoration), 8vo., Paris, 1858-87. WILLIS and CLARK, *Architectural History of Cambridge*, 1886, Glossary in iii, 606-23. *The Agricultural Dialect-words of Wiltshire*, reprinted with others, in ARCHEOLOGICAL REVIEW, 8vo., 1888, p. 33-9, with notes by prof. W. W. Skeat. *Dictionary of the leading Technical and Trade Terms*, 8vo., 1888.

TERM, TERMINAL, THERME, and HERMES (Gr. ἑρμης, pl. ἑρμαι; and the diminutive Hermæus, ἑρμῆδιον). A quadrangular pedestal corresponding to the stature of the human body, and carrying a head only, of Hermes. Mercury presided over roads, whence he was called ὁδῖος; and the remarkable statues terminating in a square trunk, erected as a sort of tutelary gods in the streets, which played so remarkable a part in the Peloponnesian war, were after him named "Hermæ". Many statues of this character were called Hermæ, even though the bust upon them was that of another deity. Some statues of this kind, described by a name compounded of that of Hermes and of another divinity; e.g., Hermæanubis, Hermæares, Hermæacles, Hermæros, and Hermæpan, doubtless carried the heads of Hermes and of the other god, united as in the bust of Janus. In another class of such works, the bust seems to have been a portrait, hence *termini*. The Greeks placed them in front of their houses, temples, gymnasia, porticos, and tombs, at the corners of streets, on highways as mile-stones, at cross-roads as sign-posts (in such cases sometimes three or four heads were grouped together), and as boundary marks everywhere. The Romans are said to have used them as posts for ornamental railings, because in the shoulder is a hole into which the rail might have been inserted; but it may have been the socket for an arm, or a projection, on which to hang garlands; or, as in the case of the two bronze busts at Pompeii, for transporting them from place to place. Small hermæ were also used as pilasters, or decorations for piers of gateways, as in the bassi-relievi of the *carceres* of the Circus, where they surmount a projecting cornice ranging over the arches. A unique example is given in SAINT-NON, *Voy. pitt. de l'Italie*, fol., Paris, 1781-86, ii, 65; and also as supports for furniture and utensils. SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE, *Townley Gallery*, 8vo., 1836, ii, 193, etc.; and the *Pompeii*, i, 141. 5. 14. 25.

In later times, the pedestal (Fr. *gaine*; Ital. *guaina*) carried heads down to the waist, of gods, chiefly Mercury, and of Apollo, Hercules, Diana, Ammon at Megalopolis; etc. In more modern times other figures, with arms, were introduced for decorative purposes: and sometimes the pedestal is made larger than the bottom of the bust or term. MILIZIA, s. v. Fuga, states that M. A. Buonarroti introduced (1534-50) terminals in his tomb to Julius II in the church of S. Pietro in Vincoli. PEDESTAL.

TERMES; the white ant. This insect devours the heart of timber, reducing it to powder, while its surface remains unbroken affording no indication of the ravages beneath. A receipt for preserving wood, forwarded by the Secretary of State for India, is given in *BUILDER Journal*, 1860, xviii, 44. "The American pitch pine is exceedingly durable, and is much used in the West Indies, etc., for flooring, as it is free from the attacks of the white ant"; *HOLTZAPFEL, Cat. of Woods*, 8vo., 1843, p. 100. *CORRY, Coast of Africa*, p. 140. The EUCALYPTUS, Jarrah, called mahogany in West Australia, is proof against this insect and the sea worm, 20 to 30 years, as explained in *BUILDING NEWS Journal*, 1862, viii, 288. The Bilian or Ironwood found in Sarawak, Borneo, is also impervious to the attacks of white ants: when immersed in either fresh or salt water it is never known to have decayed. INSECT. TEREDO or sea worm.

TERMINAL. The name given to a patented pot for a chimney, to cure, by its form, a smoky chimney, and to secure a permanent architectural finish to a shaft in any style of architecture. One of the best was the invention about 1852 of John Billing, of London, of a terra-cotta terminal with a screen between each. It is also the name given to the BENCH END of a seat in a church, which is often very elaborately carved, as in the private chapel of Lambeth palace. TERM.

TERMINUS; or RAILWAY STATION. CIPPUS. BOUNDARY.

TERNI (Anc. Interamna). A town of Umbria, in central Italy, situated on the via Flaminia. There are remains of an amphitheatre in the gardens of the episcopal palace; of a circular temple, called of the Sun, in the church of S. Salvatore; of a so-called temple to Hercules in the cellars of the college of S. Siro; and of baths in the villa Spada. It is the see of a bishop. The cathedral dedicated to Sta. Maria Assunta, was designed about 1653 by G. L. Bernini; its high altar is rich in marbles; an isolated tabernacle is by C. Murena, and dates about 1750. The church of S. Francesco, 1218-65, has a good Lombard portal, and square campanile; the interior modernised 1672 and 1770. There are about eight other churches of Renaissance architecture of no particular merit (*WEBB, Continental Ecclesiology*, 8vo., 1848, p. 466-77). CALINDRI, *Saggio statistico*. 28. 50. 96.

TERRA ALBA. A name given to ground gypsum. Also to Cornish clay. Much of the gypsum used in America for this substance is entirely imported, of two qualities, from Nova Scotia, and is ground at Newburgh, and at New York city.

TERRABILLIA (FRANCESCO); see TERRIBILIA.

TERRACE. A platform formed by art, in front of an edifice, usually for a promenade, as at Windsor castle, which, however, is chiefly on natural ground. *BLONDEL, Cours d'Arch.*, 8vo., Paris, 1777, vi, 126-42, devotes several chapters to the construction of a terrace, with examples. EMBANKMENT. EARTHWORK. ITALIAN GARDEN. PLATFORM. SCREEN WALL. TALAR. TERRAZZO. The old terraces at S. Germain are described by SAUVAL, *Histoire de la ville de Paris*, fol., Paris, 1733, ii, 303. The "Terrace" to the Adelphi buildings in the Strand is formed entirely on arching raised above the old shore of the river Thames. In *SOTHERAN, York Guide*, 8vo., York, 1796, p. 65, the word "miranda" is used for the terrace, 200 ft. long, on the first floor of the grand-stand at the Knavesnirre racecourse, where the company can see the races. At Cliveden house, Berkshire, on the south side, is a terrace 360 ft. long and 26 ft. wide; flights of steps lead down 25 ft. to a walk 18 ft. wide, below which is an open lawn. At Polesdon, Caversham, Oxfordshire, 1,800 ft. by 36 ft.; and another 1,300 ft. by 40 ft.; *NEALE, Seats, etc.*, 2 ser., i. The terrace in front of the Houses of Parliament is 673 ft. 6 in. long and 35 ft. wide: *CIVIL ENGINEER, ETC., Journal*, 1837, i, 12, 31, 103.

Half of the east terrace of Somerset house fell in, 26 Dec. 1788, with considerable damage to the buildings; *EUROPEAN MAGAZINE*, p. 74-5. Ramsay terrace, Edinburgh, fell in, March 1, 1860; *BUILDER Journal*, xviii, 157. In December 1869 part of the terrace next the embankment fell in, over the hall at King's college. Cast-iron girders had been used (as usual at the

time of construction) and from unusual weight having been brought on them, every girder snapped in two.

The account of the methods of forming the surface of a terrace, in Roman times and at present in Italy, is explained *s. v.* GRÆCINICUM. *RUSCONI, Della Architettura*, fol., Venice, 1590, shows the process by operators at work.

TERRACE AND TARRACE MORTAR; see TARRAS.

TERRACE ROOF or FLAT ROOF (*Sp. azotea*). Those formed of boards and joists and covered with lead or zinc are described *s. v.* FLAT. Terraces are of great service in hot countries, as to them the inmates ascend in the evening to enjoy the cooler atmosphere and winds, through June to August, and to sleep. The formation of the terraced roofs in India is well described in *BUILDING NEWS Journal*, 1856, ii, 634. *CHUNAM, Pisé*. The flat roofs of Buenos Ayres and Monte Video are of a somewhat similar formation; *BRITISH ARCHITECT Journal*, Oct. 26, 1838, p. 289. In Italy, especially in the southern portion of the country, flat roofs formed of pozzuolano and grits are extremely common; they answer very well so long as there is no settlement of the walls. The roofs in Cyprus are all flat-arched, and although not absolutely waterproof, the dryness of the climate makes them practically sufficient. The spandrils are filled in with rubble masonry to a level surface, then covered with a concrete composed of one-third lime, one-third small grit or pebbles, and one-third of broken tiles; this is smoothed over and over with a trowel to get a fine hard surface. The whole is then covered with an inch or two of earth to protect the surface from the action of the sun until dry; *L'ANSON, Buildings in Cyprus*, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1882-83, p. 19.

Flat roofs have many advantages, but when formed they must be thoroughly well constructed, and the walls stable to prevent settlements and cracks. About 1797-1829 lord STANHOPE put forward a fireproof composition for a flat which was much used. The terrace roof on the taverns at the late Hungerford market, designed by Charles Fowler about 1832, is described in the *INSTITUTE OF BRITISH ARCHITECTS, Transactions*, 4to., 1836, p. 47. At his own house he formed one with three courses of tiles embedded in pure cement, and laid upon cast-iron bearers, curved for a fall, placed about 3 ft. apart, having a covering of mould 9 ins. thick which forms a garden. At the market, each roof was 33 ft. 6 ins. by 29 ft., of the same construction. *PASLEY, Limes, etc.*, p. 163. *Flat tiled roofs explained*, in *BUILDER Journal*, 1845, iii, 371; and 1851, ix, 265; 1860, xviii, 758, over a dining-room; 431, 485, 517, for cottages; and 1861, xix, 175. Many of the houses lying between Hoxton and the City road are remarkable for their lofts and flat roofs, from whence good prospects of the then fields were obtained; and afforded the means whereby the tenants carried on their peculiar occupations, as bird fanciers, amateur florists, laundresses, etc.; *BUILDER Journal*, xvii, 472. The *CIVIL ENGINEER, ETC., Journal*, 1841, iv, 141, describes the flat roofs and floors at Austen's artificial stone works, New road, bearing heavy weights. Such flats had been formed at an earlier date and given up on account of condensation on the under-surface; this is obviated by furring out for a ceiling; or by laying the flat upon joists, and lathing and plastering to the under-side. The more modern construction of FIREPROOF FLOORS commencing with Dr. Fox's system, 1844, known as FOX AND BARRETT (*CIVIL ENGINEER, ETC., Journal*, vii, 321), are now largely put into practice combined with iron girders, for any extent of surface.

The roof of the infantry barracks at Devonport was found defective either from the asphalt or condensation. The asphalt or "mineral lava" roof of the armoury at Cirencester proved defective; *BUILDER Journal*, 1860, xviii, 207. The roof of the Albert model cottages, erected in Kennington park for a lodge, had to be removed and was replaced with Claridge's asphalt. Roofs are now often formed of Spyssel asphalt laid on concrete carried by iron joists, with skirtings of asphalt all round the parapets, etc., to render the work water-tight, while a thin layer

of very fine clean pebbles from the seashore is usually applied on the surface while the asphalt is still hot.

ESPIE, *On Fires*, 8vo., 1765, p. 31, 54, shows the construction of three brick-arched floors, each 28 ft. by 18 ft. with walls 42 ft. high and 2 ft. thick. SIMMS, *French Method of Constructing Flat Roofs with Pots*; the voussiors formed of cylindrical earthenware pots, both ends being closed, some 9 ins. long and 5 ins. diameter. The thrust of the arches is resisted by iron bands, and the external walls tied together. The under-side is plastered for a ceiling. The top is laid to an incline, covered with béton, smoothed over with a thin coating of hydraulic mortar, covered with canvas stretched tight, and the mastic poured over it; INSTITUTION OF CIVIL ENGINEERS, *Transactions*, 13 Feb. 1838; and CIVIL ENGINEER, ETC., *Journal*, i, 140. *On Flat Roofs covered with Clay and other Substances*, in DALY, *Revue Générale*, 1843, iv, 151, 205, 255, quoting DORN'S work thereon (now scarce), and another by G. LINKE, referring thereto; this long article is translated in ARCHITECT, ENGINEER, ETC., *Journal*, 1843, iv, 319, 358. The employment of asphalt on a slightly curved roof is shown in DALY, *Revue Générale*, 1839, i, 47.

KRAFFT, *Les plus beaux jardins*, fol., Paris, 1810, ii, 67-68, gives the garden placed upon the roof 80 ft. long and 30 ft. wide, of the house of M. d'Etienne, in the rue Caumartin, at Paris, by J. G. le Grand, probably just before his death in 1807. The conversion of the roof of a house into useful purposes, as at the Pleasance, in Edinburgh, is detailed in BUILDER *Journal*, 1862, xx, 681. This is a system advocated by E. Chadwick, *idem*, 1867, xxv, 528.

The roof of the church at Batalha, in Portugal, is quite flat, covered with large stone slabs, and suitable to the climate. Some churches, in the earlier Romanesque style, have flat roofs, the middle aisle being generally separated from the side aisles by simple piers without half columns, or by a range of columns only, as at Gelnhausen; the old church at Mittelheim in the Rheingau; abbey church, near Rastadt in Baden; the Scotch convent at Regensburg; the monastic church at Paulinzell, near Weimar; the monastic church at Heilsbronn near Nuremberg; the naves of some of the churches at Cologne, etc. MOLLER, translated by LEEDS, *Memorials*, 8vo., 1836, p. 46, 116. Other examples are named s. v. STONE ROOF.

TERRACINA (Anxur of the Volsci, Trachina of the Greeks, Tarracina of the Romans). A town near Frosinone in southern Italy. The harbour about 3,800 ft. in circuit, formed by Antoninus Pius (138-161) is now silted up; there is a small port at the end of the canal of Terracina. The ruins of the old castle of Theodoric (489-526) on the heights, is given in SEROUX D'AGINCOURT, *History of Art*, etc., fol., 1847; reproduced in ARCHITECT *Journal*, 1870, iii, p. 104. The town is the see, united with Piperno and Sezze, of a bishop. The cathedral dedicated to S. Pietro, is built (Italo-byzantine) on the site of the temple to Jupiter Anxur, designed by Vitruvius for consul Posthumus, of which several fluted marble columns have been re-used. A temple to Apollo was built for C. Postumius Pollio. There is a handsome episcopal palace of Pius VI (1774-1800). ROSSINI, *Viaggio Pittorresco da Roma*, fol., Rome, 1839, pl. 41-5-8. STARKE, *Travels in Europe*, 1839, p. 259.

The walls at Circeo (or San Felice) near Terracina, were the first, among such Italian ruins, that received the name "Cycloplan", and were accidentally discovered in 1792, and led to the investigations of the Archeologic Institute at Rome, and DODWELL, GELL, and by MÜLLER in *Roma Campagna*. DODWELL, *Cycloplan Remains*, fol., 1854, gives, in several plates, the walls, a modern gate, ruins of a temple and of a bridge near; and of an aqueduct three miles distant near Rome. "The square stones in some specimens have a sort of groove round the rim, leaving a raised surface in the middle"; FREEMAN, *History of Architecture*, 8vo., 1849, p. 85, etc. 28. 50. 78. 96.

TERRA-COTTA. Baked earth; an artificial stone; a hard, smooth, and more durable material than marble or stone. Terra-cotta is of three sorts, all depending on the quality of the earth

from whence it is burned. 1, a red sort, like tiles or other plain unglazed pottery, the colour being due to the presence of oxide of iron, and its destruction to the further oxidation of this metal and not to the presence of salts, because nitre and everything of that kind is driven off in the burning. 2, a better sort burnt from earth nearly free from iron, being purer. 3, like the Welsh, which is white as "mortar china", and has a great deal of fels-path in it. The component parts of the usual terra-cotta are potter's clay, fine sand, and pulverized potsherds, mixed with water and thoroughly incorporated, and either modelled or cast in the state of a thin paste, in porous plaster moulds, which absorb the moisture. After air drying, the objects are baked in proper kilns at a very high temperature, during which process the shrinkage and warping are sometimes very great. The details of the different gradations in manufacture which exist between terra-cotta, as baked fire clay, and porcelain, need not here be entered upon, but all of them are subject to the inherent defects of contraction and distortion. It is made of various natural shades and tints, from nearly white to buff, red, pink, to deep red, according to the mixture of clays, or the manner of firing. It may be also artificially glazed with all the colours of the rainbow. Burnt in a kiln it attains the hardness and durability of the best brick, and is well used with it in blocks for building, for being manufactured hollow it is light to handle. BRICK. FIRE CLAY.

The most valuable of the clays for terra-cotta are those in which the hydrous silicates of alumina have sufficient peroxide of iron combined with them to give a good colour, but which is so free from other impurities as not to be too readily fusible. The proportions of the several ingredients contributing to form the mass of the clay used in Greek terra-cotta vases appear to have been as No. 1; the articles were slightly baked or burnt. Two clays used by exhibitors in 1851 were analysed by Dr. Penny of the Andersonian University at Glasgow, as Nos. 2 and 3.

	No. 1.	No. 2.	No. 3.
Silica ...	53.0	65.20	62.85
Alumina ...	15.0	33.41	35.65
Lime ...	8.0	.32	.45
Magnesia ...	—	.13	.15
Oxide of iron ...	24.0	.49	.59
Phosphates ...	—	.45	.31

A cubic foot of terra-cotta stood a pressure of 464 tons; B. J., 1856, xiv, 20. A block of Portland stone, about 6 ins. cube, cracked at 288 and crushed at 292 tons per ft. sup.

Bath stone, nearly 6 ins. cube	"	"	88 and 104
ditto Terra-cotta, nearly 6 ins. solid	"	"	442 and 523
" 6½ × 11½ × 5½ hollow, slightly made and unfilled	"	"	22 and 80
" ditto filled with Roman cement	"	"	45 and 163
" 5½ × 11½ × 6½ hollow, with a cross wall	"	"	46 and 186
A common stock brick	"	"	14 and 17, and 75 and 82

BARRY, in Royal Inst. of British Architects, *Sessional Papers*, 1867-68; experiments by D. Kirkaldy. Terra-cotta weighs about 122 lbs. per foot cube if solid; if used of a thickness of about 2 ins. and hollow inside, it averages 68 lbs. (p. 270).

While soft, the prepared clay is capable of being moulded or impressed with any pattern; when well dried, before being "fired" or placed in the kiln, it may be cut, or carved by hand, or turned in a lathe, so that the most artistic treatment and the most delicate work can be executed, and then made permanent by the action of fire; and the forms thus produced may be coloured in such a way as to be unfading and everlasting. The mode of bringing the clay into the form which it is to assume as terra-cotta differs quite as much as the material used. Thus the ancient Greeks seem to have treated it as ordinary potter's clay; the Romans moulded it; and the more modern appear to have modelled it, a mode of treatment for which the finer qualities are specially suited. With a view to insure perfect burning, an uniform thickness must be preserved in all parts, usually about 1½ inches, but proportionate to the bulk and strength required. Considerable attention is necessary in the process of drying, that it should be slow and regular, so as to avoid dis-

tortion; the same considerations regulate the burning, which should proceed by very slow degrees to a white heat, and ample time be allowed for cooling; practice differs, but ten to fourteen days are allowed for drying, seven to fourteen for burning, and three or four days for cooling.

The history of the use of this material from Babylonian times to the present day is now well known. Etruria, Hindostan, Greece, ancient Italy, and modern Italy, Spain, France, England, and later America, have each contributed to the employment, and many to the revival, of the art. Some doubts have been expressed, even in modern days, as to the durability of the material. Thus the *ATHENÆUM Journal*, 1846, reviewing BRONGNIART, *Treatise on Pictile Art*, notice "the messrs. Vizebout of Toulouse, referred to as the best modern workers in terra-cotta, as putting only a thin crust of the finest clay on their finer productions"; and "the copy of the monument of Lysicrates executed by the brothers Tribucci after the drawings of Molinos, placed in the park of S. Cloud in 1808, was crumbling to decay in 1846"; and concludes, "we are convinced that terra-cottas will not bear exposure, and that their use should, therefore, be confined to internal decorations"; *BUILDER Journal*, 1846, iv, 431.

In England, the following list of the early use of moulded bricks and terra-cotta may be permitted.

- XIII cent. Little Coggles hall church, Essex; was the abbot's private chapel; moulded brick dressings (restored 1879).
 1260-1280 Little Wenham hall, Suffolk; TURNER, *Dom. Arch.*, 1851, p. 151.
 1307-77 Fritenden church, Kent, in north wall of chancel, quatrefoil panels of hard brick, of Decorated period. *ARCHÆOLOGICAL JOURNAL*, March 1848, p. 54.
 xv c. early Falkbourn hall, Essex. PARKER, iii, 283.
 Chignell Smealey church, Essex, not only entirely of brick, but had a brick font; and called locally "brick Smealey".
 1440-1500 Eton college, some parts.
 1455 Tattershall castle, Lincolnshire.
 1482 Oxburgh hall, Norfolk.
 1500-25 Layer Marney hall, Essex, moulded bricks, etc., same date and style as S. John's college, Cambridge. Tomb with effigy in the church of Layer Marney.
 cir. 1500 Wolterton house, Norfolk, *BUILDER Journal*, viii, 390.
 1500 Moulded bricks at Westhorpe hall erected about 1500 by Brandon, duke of Suffolk; a hard compact white brick, of which some still ornament a bridge close by the ruins.
 At Granby church, Lincolnshire, at the east end is a window of Perpendicular date (1377-1546) of considerable size, the whole of whose jambs and tracery are composed of contemporary moulded terra-cotta.
 1515-25 Hampton Court palace.
 1516 Four Aungells of Erthe bakid in an oven after the colour of white marble. Torregiano's contract for a tomb for Henry VII; ACKERMANN, *Westminster Abbey*, 4to, 1812, i, 141.
 1516 Tomb of John Young, master of the Rolls, in Rolls chapel.
 1519 Tomb of Margaret, countess of Richmond, died 1509. Both by P. Torregiano.
 1521 The medallion busts of the Roman emperors—affixed to the turrets on each side of the gateways of the courts, £2 6s. each of Johannes Maiano (not by Della Robbia, nor gifts from Leo X); Letter in Record office, June 18, 1521, asking for payment. Calendar, Henry VIII, iii, No. 1355, and other works. LAW, *Hampton Court*, 1885, p. 50.
 1525 cir. Nether hall, Essex.
 1525 West Stow hall, built by Brandon, duke of Suffolk; the noble gatehouse remains.
 Ixworth Thorpe church, has a doorway of which the moldings and arch are formed of red brick.
 1529-30 Sutton place, near Woking, Surrey. Moulded bricks, etc.; B. J., xiii, 325.
 At Trensham manor house are the arms of king Henry VII or VIII of baked earth, about a yard square; AUBREY, *Surrey*, iii, 367.
 1573? Wyandham church, Norfolk. Elaborate sedilia and niches of terra-cotta.
 1605 Monument of John Stow in S. Mary Undershaft church, Holland house, Middlesex.
 1607-24 Ham house, Surrey.
 1610 Blickling hall, South Erpingham, Norfolk.
 1620 Oxhead hall, South Erpingham, Norfolk.
 Giffard's hall, near Bibury, Suffolk.

The history of the employment of terra-cotta in later years is given in the paper of 1866 by BARRY above noticed, p. 261 and 272. In 1669 it was suggested that with a composition of clay and sand, used in molds, it would make window-frames, chimney-pieces, frames for doors, in several pieces, burnt, and set together in a fine red cement. Earthen pipes made fine, thin, and durable to carry water underground were used at Portsmouth; and earthen backs for grates and chimneys, formerly made by sir John Winter at Charing Cross—a feasible operation neglected in England; WORLIDGE, *Systema Agriculturae*, fol., 1669, p. 214, chap. x, sect. 5, "Of Amendments and profitable Experiments in Building". The revival of the "manufacture of artificial stone, hardened by the vitrifying aid of fire", was due to Miss Coade, who about 1768 started in Lambeth, a factory for statues and every species of architectural ornament, at which John Bacon worked previous to his election in 1770 in the Royal Academy. The sculpture in the west portico of Greenwich hospital, representing the death of Nelson, was designed by B. West, and modelled by Bacon and Panzetta; the Gothic screen in S. George's chapel at Windsor, supporting the organ gallery; the three statues of king Edward, the Madonna and child, and S. George and the dragon on the west front of the chapel; arms, etc., of the Trinity house on Tower hill; the group of statues in front of the Pelican office, Lombard street (HUGHSON, *London*, 8vo., 1817, p. 333), are all from Coade's works, whose "artificial stone ornaments" were in March 1824 conducted by Croggon (*SOMERSET HOUSE GAZETTE*, p. 381). The ornamental details seen at S. Pancras church were made by Rossi 1819-22. Bas-reliefs were about the same time placed before the Custom house; and the statue of Britannia crowning the Nelson monument at Yarmouth. In 1773 Wedgewood and Bentley issued their first catalogue of goods sold in Great Newport street. In 1786 Coade executed figures from West's window at Oxford. Font in Debden church (LYTHODIPYRA; *BUILDER Journal*, xviii, 441). G. Bubb executed 1820 the frieze for the opera house in the Haymarket, and the pedimental sculpture and statues of Cumberland terrace, Regent's park. Since then the use of terra-cotta has gone on increasing, until now it is applied to so many useful and ornamental purposes, that only a manufacturer's illustrated catalogue could sufficiently describe them; and the buildings which will most readily occur as being decorated by this means are the South Kensington museum, the Royal Albert hall, and Dulwich college. The theatre entrance of the South Kensington museum was finished 1870 at either end of the parapet by colossal groups in terra-cotta by messrs. Doulton and Co. One group is one of the largest ever executed, and represents Armed Truth—a sitting figure with a wreath in one hand resting on the knee, while on the other side stands a boy armed with a drawn sword. The height is 8 ft. by a width of 6 ft. and 4 ft. at the base; it was burnt in four pieces only, and the joints are so well arranged that when put together they are completely concealed. Similar statues can be supplied for about £120 apiece, exclusive of modelling. The natural history museum at South Kensington, designed by A. Waterhouse, R.A., 1881; the Constitutional Club, Northumberland avenue, by R. W. Edis, 1887; are among the latest examples of the extensive use of terra-cotta in this country.

The terra-cotta church at Platt, near Manchester, was executed 1844 by the Ladyshore works, near Bolton and Manchester; also church at Leverbridge 1842-44; and at Ilsholme, near Manchester, all from the designs of Edmund Sharpe. *BUILDER Journal*, iii, 1845, p. 202, 214, 248, 571. *BUILDING NEWS Journal*, 1861, vii, 562. *ILLUSTRATED LONDON NEWS*, 1845, vi, 77. SHARPE, *On the Adaptability of Terra-Cotta to Modern Church Work; its use and its abuse*; *BUILDER Journal*, 1876, xxxiv, 553, 643 view, explaining the above churches and S. Paul's church, Scotforth, 1847. A terra-cotta portico in Cumberland street, Hyde park, by A. H. Morant and J. M. Lockyer, is described in *BUILDER Journal*, 1863, xxi, 899, from Blashfield's works: whose statues, etc., are described in *idem*, 1860,

xviii, 783. The productions of Blashfield and of Blanchard and Co. at Architectural Exhibition, *idem*, 1863, xxi, 289. Blashfield's works at Stamford are described in *BUILDING NEWS Journal*, 1859, v, 196.

Terra-cotta stoves 1867 for greenhouse or bedroom, and the gas atmpyre, by Edwards 1851; also Beehive stoves. *Glazed terra-cotta*, Lipscombe's patent, 1877, extremely hard and compact, being fired at nearly double the heat of unglazed terra-cotta: the joints are ground true; it is stated to be only half the cost of Portland stone, and to be imperishable.

Publications s. v. POTTERY. A long "list of books and writings relating to bricks, terra-cotta, and other ancient pottery", is given at the end of the paper in 1866 by BARRY, referred to above. HOLT, *Essay on Artificial Stone*, 8vo., 1730. PINCOT, *Origin, nature, uses, and properties of Artificial Stone*, 8vo., London, 1770. COADE, *Enchings of Artificial Stone Manufacture*, 1777-79. COMBE, *Description of the Collection of Ancient Terra-cottas in the British Museum*, 40 pl., 4to., 1810. GRUNER, *Specimens of Ornamental Art*, fol., 1850, gives pl. 13 and 14, three Greek friezes. GRUNER, *Terra-cotta Architecture of North Italy*, xii to xv cents., fol., 1865, 48 pl. CADORIN, *Studi Teorici e Pratici di Architettura e di Ornato per le crizione principalmente delle fabbriche in Terra Cotta*, etc. (Italian and French), 28 pl., fol., Paris (1870?). CHABAT, *La Brique et la Terre*, 80 pl., fol., 1880. *Architectural Terra-cottas in Greece and her Italian Colonies*; BUILDER *Journal*, 1882, xlii, 311; xliii, 648; 805. *Encyclopædia Britannica*, 4to., 1888.

BLASHFIELD, *Ancient and Modern Pottery*, read 6 September 1859, before the Northampton Architectural Society, gives a detailed history of the manufacture, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1859-60, p. 117-34. *Right use of Terra-cotta*, in CHURCH BUILDER *Journal*, 1869, p. 44. *Terra-cotta and Artificial Stone as connected with Architecture*, by C. FOWLER, read at ROY. INST. OF BRIT. ARCHITECTS, June 10, 1850, and printed in ARCHITECT *Journal*, ii, 292. *Terra-cotta and Luca della Robbia Ware*, by Rev. Dr. ROCK, B. J., 1864, xxii, 407; 613, 644, 682. *Terra-cotta, Bricks, Encaustic and other Tiles*, by G. R. REDGRAVE in Official Reports, International Exhibition, 1871; and BUILDER *News Journal*, 1871, xxi, 264, 311. HENMAN, in BRITISH ARCHITECT *Journal*, 1887, p. 105. *Artistic employment of Terra-cotta*, in BUILDER *Journal*, 1869, xvi, 491. *Terra-cotta at the International Exhibition*, *idem*, 1871, xx, 371. *Architectural employment of Terra-cotta*, *idem*, 1880, xxxix, 195, 230. *On Terra-cotta*, by James Doulton, *idem*, 1886, vol. 50, 537. 1. 71.

TERRA DI SIENNA. Raw Siena earth; see SIENNA.

TERRA LEMNICA, terra segillata. A beautiful red-coloured earth of the ancients, of three shades, red, middle, and the less red, the best quality of which came from Lemnos, stamped, to show it was genuine; from the Balearic islands, and from Cappadocia; also from Egypt. The best cost three denarii, about 2s. per pound. An inferior sort from Africa was called *cicerculum*, and cost only eight asses, or about sixpence. It was a material used in painting as at Pompeii.

TERRAS; see TARRAS or TRASS.

TERRA VERTE. An OCHRE of a bluish-green colour. 23.

TERRAZZO ALLA VENEZIANA. At Milan, the streets in many places which run parallel to, and immediately within, the canal, retain the name of *terrazzo*, or terrace; *North Italy*, 1846. The composition is made of only fresh lime and sand, with pieces of marble irregularly broken up; the composition is used almost dry, and beaten till quite hard; then rubbed even and polished. The excellence of these floors, now so much admired, depends entirely on being strongly beaten; ETON, *Survey of Turkish Empire*, 8vo., London, 1798, p. 231. GRÆCANICUM opus. LITHOSTROTUM, or pavimento Veneziano. GRUNER, *Specimens of Ornamental Art*, fol., 1850, pl. 29, gives two examples from the palazzo del Te, at Mantua. C. H. WILSON, *Venetian Paving*, in CIVIL ENGINEER, etc., *Journal*, 1841, iv, 37.

TERRE BLEUE. The same colour as blue BICE and iris.

TERRETTA. A great portion of the enrichments at the Far-

nesina palace, designed for Agostino Chigi, by B. Peruzzi, are in "terretta", and by his own hand. He also painted a façade for one of the pope's chamberlains, in "terretta", between the campo de' Fiore and the piazza Giudea; a performance particularly admirable for the perspective views. VASARI, *Lives*, s. v.

TERRIBILIA (FRANCESCO), sometimes written Trebilia, Tribiglia, and Tribilia, son of Palamede, also called Marani (BOLOGNINI-AMORINI, *Vite dei Pittori*, 8vo., Bologna, 1841-3, v, 397). He is honourably mentioned by TEMANZA, in the life of Palladio. He designed and decorated many edifices in Bologna; they include the palazzi Orsi (later Borghi) in the strada S. Vitale, and the palazzo Caprara da S. Salvatore (later Beaugharnois); 1578 the palazetto della Zecca, or its façade (plate in LANDI); 1562 the long and well-arranged portico and the severe façade of the Archiginnasio (the former university) on east side of piazza della Pace. This front 300 ft. long is considered to be one of the finest pieces of architecture in the city; it has been ascribed to Barozzi, but the date 1562 appears correct: the grand staircase of the Servite monastery of Sta. Maria Addolorata; the cloisters 1548 of the monastery (afterwards a prison) of S. Giovanni in Monte; the collegio di S. Luigi; and the graceful conduit in the giardino de' Semplici (now the third court) at Bramante's palazzo pubblico. The magnificent chapel of the saint 1596 in the church of S. Domenico is attributed to him and to F. Ambrosini. *Illustrations*, s. v. Chapel, pl. xxx. He died 1603 in that city, where his design 1580 for the completion of the front of the church of S. Petronio (A. Vincenzi's was selected) is preserved by the wardens of the fabric. NAGLER says he died 1620. 28. 68. 94. 105.

TERRIER (Fr. *terrier*). A land book, a register or account of lands. Those best known in this country are the ecclesiastical terriers made under the provisions of the 87th canon. They consist of a detail of the temporal possessions of the church of the parish. Owners of property in land also have a "terrier" supplied with the map, showing the name of the tenant, the name of the field or holding, and its size. ROWE, *Glebe Terriers*, read at SURVEYORS' INSTITUTION, 1881. A *terrier*, from Burn, *Ecclesiastical Laws*, is given in archdeacon COXE, *Cursory Survey of Churches*, etc., in *Lindisfarne*, 8vo., 1860, p. 44. 14.

TERRO METALLIC. A term used by Thomas Peake from before 1833 for the material, a particular preparation of clay, and with a peculiar burning, of which at Tunstall, Staffordshire, he made drain and conduit pipes, tiles of all sorts, and bricks. A full description is given in BUILDER *Journal*, ads. for October 30, 1847. METALLIC LAVA. Orsi and Armani's Lava. 71.

TERSOSOS; see TARSUS, in Asia Minor.

TERUEL (the ancient Turbula). A city of Aragon, in Spain, situated on the river Guadalavir or Turia. The city gates have the Aragonese towers. The old cathedral is dedicated to the Assumption of the Virgin and S. Emerenziana, virgin and martyr; the retablo to the high altar was executed 1538 by G. Yoli or Yole of France. Also the retablo in the parish church of S. Pedro, which with its cloisters; that of Santiago; of S. Martin with its Moorish tower; several monasteries; an episcopal palace; an hospital; a fine church and college of the Jesuits dating after 1750; an institution for the poor and a foundling hospital in one; with a bull-ring accommodating 9,000 persons, are other buildings of note. There are fourteen squares, the chief one having arcades. The *arcos*, or aqueduct, having two rows of arches 180 ft. high, was executed 1552-64 by Pierre Bedel of France. 50. 66. 96.

TERYSING, or terrasing; see STUCCO.

TESHU H' LUMBU, Teshoo-Loomboo, and Chashe-loum-Boo. The residence near LASSA, of the Teshu-Lama Bogdo-Lama, or ruler of the western part of Tibet, or Eastern Tibet. It is a palace, or rather a monastic establishment, founded 1447, on a small plain surrounded by lofty mountains. It is correctly named Iachi H' Lumbo, and contains from three to four hundred houses, monasteries, temples, and palaces, which are surrounded by a wall, and all communicate with each other. The

performance of the various religious duties in the palace of this, their secondary chief, occupies daily 3,700 monks. The most remarkable part is the mausoleum of one of his predecessors, who 1781 died not without suspicion of poison, at Pekin, whither he had been summoned by his Chinese political superiors; and this, as being a fine specimen of Tibetan sculpture, is carefully described by TURNER, *Embassy to the Court of Teshoo Lama*, 4to, 1800. RITTER, *Asien Erdkunde*, etc., 8vo., Berlin, 1822, iv, 243. MOORCROFT, in *Asiatic Journal*, 1826, xxi, 14. 50.

TESIFONE. The French form of CTESIPHON.

TESSANCOURT, Quarry of. The stone was used in and near Paris 1678; as described in report edited by Michelot, in DALY, *Revue Générale*, 4to., 1852, x, pl. 13 and 15.

TESSE. See TEYSE of paving.

TESSELATUM; OPUS. Inlaid marble or glass work. According to CIAMPINI, *Vetera Monumenta*, Roman mosaic work was divided into "tesselatum" or cubes, and "sectile" or crusta or slices: these were applied to pavements generally, being rarely found on walls. In the Christian period, it was of two sorts; glass tessellation, generally called opus GRECANICUM, which was conventional and generally used in church furniture; and marble tessellation, called indifferently GRECANICUM and ALEXANDRINUM, also conventional and formed into pavements. Of these, opus tessellatum was probably the most ancient. It consisted of small cubes of marble called TESSERÆ, about three-quarters of an inch square, sawn or worked by hand into simple geometric figures, and set on a bed of concrete or cement. MOSAIC WORK. MUSIVUM OPUS. ROMAN MOSAIC.

Publications, s. v. MOSAIC. *Vetusta Monumenta*, i, 1747, gives pavements at Wellow, Somerset; and Cottesstock, Northamptonshire; ii, at Winterton, Warminster, and Woodchester. HEARNE, *Stonesfield at Woodstock*, 8vo., 1712. Wroxeter, near Shrewsbury, fol., 1706. Harkstow, Frampton, and Bath, 28 pl., fol., 1801. LYSONS, *Woodchester*, fol., 1794; 1797. HOARE, Pitney, discovered by S. Hassell, 1828, 8vo., 12 pl., 1831-32. F. O. WARD, *History*, in *CIVIL ENGINEER, ETC., Journal*, 1843, vi, 125, from Blashfield's work. WYATT, *Lecture*, SOCIETY OF ARTS, *Journal*, and *idem*, 1847, xi, 81. MORGAN, *Romano-British Mosaic Pavements, discovery and design*, 8vo., 1886; the subjects generally combined are the Orphic and Bacchic myths, with astronomical references and symbolism.

SIRODOT, in DALY, *Revue Générale*, 1847, vii, 526-41. DELAMÈRE, *Algérie*, 4to., Paris, 1844, gives pavements at Djédjeli, pl. 10-11; Bougie, pl. 7; Constantine, pl. 145-6; Phillipville, pl. 19, 20, 39. GRAHAM, *Roman Occupation of North Africa*, in *ROY. INST. OF BRITISH ARCHITECTS, Transactions*, 1885, p. 125. *Spain*; the royal press published 1784, some fifteen pavements drawn by J. P. Arnal. LA BORDE, *Pavimento en Mosayco—en la Italia—de Seville*, 31 pl., fol., Paris, 1802, and Madrid, 1806-8. SALVIATI, *History of Mosaics*, BUILDER *Journal*, xx, 767. BUILDING NEWS *Journal*, 1866, xiii, 268, etc.; 1879, xxxvi, 347, 407, etc. *Mosaic Pictures in England*, in BUILDER *Journal*, xx, 564.

Illustrations; s. v. *Pavement*. Plate x, 1848-49; figs. 1 and 8 are mosaics, from Pompeii, in the Street of the Silversmiths. Figs. 3, 5, and 13, were all found in a house near the city walls. Figs. 4 and 6 are from near the Gate of Herculaneum. Fig. 10 is from Pompeii, as are figs. 7, 9, 11, from houses excavated by general Championnet, in the street south of the Basilica; figs. 2, 7, and 9, form the thresholds of doors. Figs. 12 and 14 are now in the Braccio Nuovo (Vatican), found in the excavations at Tor-Marancio, outside the Porta San Sebastiano. Plate xxi, figs. 1 and 2. This style of inlaid pavement from the baptistery at Florence, *cir.* 1288-93, is peculiar to Tuscany; Lucca, Florence, Pisa, and Pistoia, abounding in rich examples; incisions in white marble slabs are filled with black or very dark green marble or cement; the pavement of the duomo at Siena is the most celebrated work of this class. Figs. 4 to 9 are from San Miniato, at Florence, probably dating from XI cent. This pavement is remarkable for the variety in the patterns, and quaint orna-

ments. Fig. 3, from the duomo, at Lucca, dates from 1308. *Marble pavement* 1861 (two plates).

The "encaustic" or terra-cotta tessellated pavements of modern days manufactured by Maw and others, as in BUILDER *Journal*, 1860, xviii, 532; *Mosaic Floors, etc., idem*, 1845, iii, 343 and figures, from KNIGHT, *Pictorial Gallery of Arts*. Also the modern "Roman mosaic" of squared cubes of marble, by Burke & Co., and others. "Tessellated Tiles", six and four inches square, were shown in 1862.

TESSERA. The Latin term, from the Gr. *τεσσερα*, for a cube or dice, of different colours, of brick, stone, marble, glass, or composition, etc., and used to form a mosaic or tessellated pavement. An Act of Parliament was obtained in 1809 for covering the roofs of houses with patent tesserae; manufactured by — Johns at Plymouth, GENTLEMAN'S MAGAZINE, 1810, vol. 80, pt. 1, p. 77. Patent tesserae for copings, roofs, gutters, etc., named in CROSBY, *Price Book*, for 1812, p. 69. 14.

TESSIN (NICODEMUS or N. VALENTINSON), born 1619 at Stralsund, was 1645 court architect to queen Christina of Sweden, on the death of S. de Lavallée. He visited Italy, designed the palace at Drottningholm for the queen dowager Hedwig Eleonora, widow of Charles Gustavus; the royal villa of Strömsholm; and the mausoleum of Carl Gustav. He received 1674 a patent of nobility from Charles XI, and died about 1688. 14. 68.

TESSIN (count (1714) NICODEMUS), born 1654 at Nyköping. Son of the above, was educated by his father, proceeded 1672 with the marquis del Monte, to Italy; studied four years under Bernini; visited Naples, Sicily, and Malta, and returning to Rome, was there 1689 appointed court architect to Charles XI. He then went to Stockholm, England, and France where he remained three years; returned to Stockholm and was appointed architect to the city, where he began 1692 the palace on the site of the citadel (a plate of this edifice is dated 1694 by S. le Clerc, and another 1695), but was burnt 1697-8. It was then reconstructed by Tessin (a plate inscribed "count N. Tessin inv. et del. for Charles XII, 1703"); he also made designs for various court pageants and festivals, especially the entry and coronation of Ulrica Eleonora, wife of Charles XI; 1680-99 the Gardi palace; and the Skokloster, at Stockholm. He completed the palaces at Drottningholm and Stroomsholm; and laid out the gardens both there and at Ulriksdal; he designed the cathedral at Kalmar (or by Horleman, *cir.* 1750); the monument to Oxenstiern; the Gustavianum at Upsala; the catafalque to Charles XI in church at Riddersholm, engraved 1696 by S. le Clerc; a projected rebuilding of the palace at Copenhagen, partly carried out after his death; the nyanorrbron or new stone bridge from the stadenholm to the noorholm, 640 ft. long and 64 ft. wide; his own residence, a stately edifice, now the ofver stathallershuss or governor's residence; and many other edifices. The castle of Christiansborg is attributed to him, and was restored by C. F. Hansen. He was the first chief of the government school of art; and was chancellor of the university of Lund at the time of his death in 1728. A marble statue of him is placed on one side of the portal of the National museum. P. le Pautre engraved 1693 some of his designs. A biography was published in French by H. von EHRENSTROEM, 1826. 14. 68.

TESSIN (count CARL GUSTAV), born 1694 or 1695 at Stockholm, continued for thirteen years from 1728 the palace in that city commenced by his father; it was completed by C. Haerleman, who added the east wing and interior work up to 1753 when it was occupied by the royal family. It contains a museum, library, pictures, sculpture, etc. (ILLUSTRATED LONDON NEWS, April 27, 1844). He published *Regie Hafniensis Facies, etc.*, being the design by his father for the palace at Copenhagen. Besides being a diplomatist, he did much for the encouragement of arts and manufactures, and established 1735 the Swedish academy of Painting and Sculpture. He retired to his estate at Akerö in Sudermania, and died in 1770 or 1771. C. Tottie, in 1840 presented drawings of the palace at Stockholm to the

library of the Roy. Inst. of Brit. Arch. with a description. WEINWICH, *Kunstner-Lexicon*. NORDIN, *Minna Namnkunniga Svenska Män*. EHRENSTRÖM, *B. Arts en Suede*, 8vo., Stockholm, 1826. HAERLEMAN, *C. G. Tessin*, 8vo., Stockholm, 1753; and transl. by J. C. Dachnert, 8vo., Greifswalde, 1755. CHENNEVIERES, *Archives de l'Art Française*, Documents, iii, 118. 14.68.83.84.112.113.

TEST and TESTING. An experiment on a material to ascertain its capabilities; or upon a manufactured article, to prove its reliability for the purpose required. In testing a beam for its strength, care must be taken not to test it to its full strength, nor beyond its ELASTICITY which BUFFON and TREDGOLD considered to remain perfect until one-third of the breaking weight is laid on. Hodgkinson found the permanent set in cast-iron beams to be as the square of the load applied; and that they bore two-thirds, and even more, of their breaking weight, for long periods, without any indication of failing. GREGORY considered this may be correct for beams about 5 ft. long, it does not apply when they are longer. The rules for finding deflections and strength have been given. Ironmasters are to some extent averse to testing. A writer has been advised by one of high standing to simply specify "best merchantable iron", and if from inspection it was found not to be good it could then be tested. Testing is about the only means whereby to obtain what is wanted. It is next to useless to specify certain brands of iron with a view of getting a definite quality, as in ordinary iron, such as is used in girder work, the "best" of one maker being often equal to the "best best" of another, whose treble "best" plates may not be equal to the "best best" of a third maker.

By "work tests" is meant tapping the plates with a hammer to ascertain if they are solid, in which case each tap will produce a ringing sound; also breaking the corner off a plate here and there, before the plates are "worked", and examining the punching from the iron, for the purpose of forming some idea of its quality. The punchings from Low Moor and some of the Staffordshire brands will stand the punch without the slightest sign of cracking, whilst hard, brittle iron will break up in all directions on the convex side of the punching. Good ordinary iron, such as ought to be used in girder work, will only show slight cracks, all running with the fibre of the iron. C. G. SMITH, *Wrought Iron Girder Work*, 1877, in *BRITISH ARCHITECT Journal*, 1877, 22 June, p. 383. **SAFE LOAD. CRUSHING FORCE. STRENGTH OF MATERIALS.**

Granting that it is advisable to continue the carrying out of tests, it is advisable that some method of testing should be substituted for the present plan of testing girders whole. At present, a certain percentage of the rolled joists or other girders for a building, are specified to be tested up to loads equivalent to those given in "Shaw's Tables", which correspond to a maximum stress of 6 tons per square inch in the material [this refers to the stress per square inch at the outermost layer, and is the way engineers speak of the actual stresses in the metal distinguishable from the load which the beam will support; the outermost layer of the beam being the most severely stressed it is only the intensity of stress at that place of which one ever actually speaks], and should return to their original forms without permanent set; and this deflection test is the only one carried out. But it is not easy to measure a small permanent deflection, say $\frac{1}{10}$ of an inch, with certainty on a 20-ft. joist, with such means as are commonly used in the yard, and so it cannot be very rigidly enforced under ordinary circumstances. But it affords no clue to the properties of the material used. It would be more satisfactory, and probably not more expensive or troublesome, if the tests specified were made more like those adopted by the Registry societies. The "temper" test, for the architect's purpose, might be omitted. The "ultimate extension" test is an indication—a rough indication—of the ductility of the metal; the maximum extension before the material begins to give way locally should be known; this, however, is somewhat more difficult to measure. It would be sufficient to specify that one out of, say, every ten joists or angles should be supplied 18 ins. more

than the ordered length, the extra piece cut off, and two strips cut from it (one from the web, and one from the flange in the case of the joist) tested for tenacity and extension. The limits fixed might be, according to circumstances, either 28 to 32 tons tenacity per square inch, and 20 per cent. extension in 10 ins.; or 38 to 42 tons tenacity and 12 per cent. extension. The tests are made by preference at the manufacturer's yard, in the presence of the inspector, doubtful or special cases being sent to some independent testing machine. In the case of large orders not less than 2 per cent. of the number of plates, etc., have to be tested in this way; KENNEDY, *Mild Steel and its application to Building purposes*, at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1879-80, p. 171-2. The "registry societies" refers to Lloyd's register, the Liverpool Lloyds, etc. FAIRBAIRN, *Application of Iron to Building Purposes*, 8vo., 1857-8, p. 162-4. SPON'S *Architect and Builder's Pocket Book*, 1881. 1.

Stanchion. Take a good-sized hammer, having one face pointed, and with it examine carefully the stanchion all over. If any bits crumble out, follow on until the bottom of the fault is reached. Use a sharp-pointed chisel where necessary. Some faults are so well filled up that it is difficult for an inexperienced examiner to find them. They are generally on the face that lies uppermost in the mould, and due in most instances to want of care and patience in the "feeding", or final running of the metal. A fault may be found, which would jeopardise the stability of the whole building. To test cast-iron stanchions on the works, a hydraulic ram, and proper frame to put both the ram and stanchions into, are requisite; stanchions 20 ft. in length, with a pressure of 80 tons may be so tested.

Chain cable and Timber-testing machines, and experiments, by T. DUNN of Salford, in *INSTITUTION OF CIVIL ENGINEERS, Proceedings*, 1857, xvi, 301-8; *BUILDER Journal*, 1855, xiii, 347, and figure 418.

Stone. Particulars of the quarry and bed of each stone to be tested should be stated. It is useless to experiment upon cubes of 1 inch; 4-inch or 6-inch cubes are the least sizes, especially where large shells appear. The cubes should be carefully dressed by rubbing down the faces, which should be strictly parallel, perhaps made so in a steel frame. They should be placed on or against their natural bed. The Bath stones tested by Messrs. Poole are stated to have been placed between parallel iron plates, and the pressure communicated to the cubes, having a sheet of lead at the top and bottom, and between the upper or movable plate and the upper lead plate was a conical heap of fine sand, which was carefully pressed by the upper plate, so as to ensure an equal pressure on every particle of the upper and lower beds of the stone. Sometimes the stone is bedded with pieces of pine, from $\frac{1}{4}$ to $\frac{1}{2}$ inch thick. Leather has likewise been used (*BUILDER Journal*, 1886, p. 561); also millboard. Prof. HENRY (of the American Association of Science, 1855) experimented on blocks of $\frac{1}{2}$ -inch cube between thin plates of lead. It was found that while one of these cubes would sustain 30,000 lbs. with lead plates, it would sustain 60,000 lbs. without them; *CIVIL ENGINEER, ETC., Journal*, xviii, 377. BARLOW states that the crushing strength of Portland stone ranges from about 1,384 lbs. to 4,000 lbs. per square inch; the Institute of British Architects experiments give 2,576 lbs. for 2-inch cubes, 4,099 lbs. for 4-inch cubes, and 4,300 lbs. for 6-inch cubes, proving the advantage of testing large sizes. KENNIE gives 3,729 lbs., followed by MOLESWORTH; while HURST gives 2,022 lbs. Bailey's patent dead-weight gauge-tester, and his hydraulic dead-weight testing machine, are used for this purpose.

Cement. The machines commonly used are those by Mr. Adie and Mr. Michele (*BUILDER Journal*, xlviii, p. 283); by the former, briquettes of $\frac{1}{2}$ -inch square can be tested. Reid and Bailey's is described, *idem*, 1877, xxxv, p. 1015; Arnold's, *idem*, for October 22, 1887, p. 579. FALJA, *On P. C.*, and discussion by prof. Kennedy and others, at Roy. Inst. of Brit. Architects, 23 Febr. 1879. **PORTLAND CEMENT.**

Bricks. The soundness of a brick may be tested by clapping

two of them together by the hands, when they should ring well. A common hand-made brick was broken by a weight of 645 lbs. hung in the middle of a brick supported on beams seven inches apart. One of Beale's machine-made bricks was broken by 2,625 lbs. weight.

Machines for Testing. The HYDRAULIC or HYDROSTATIC PRESS is generally used. This is a closed vessel, with its upper surface level, completely filled with water; two openings are made in it, which are replaced by pistons of areas 1 and 10 square inches. If a weight of 1 lb. be placed on the smaller piston, a pressure of 1 lb. will be felt everywhere in the interior of the fluid, and the pressure on the larger piston will be 10 lbs. Thus a force of 1 lb. acting on the area 1 square inch, produces a pressure of 10 lbs. on the area 10 square inches. Bailey's hydraulic test-pumps. The *Liverpool Corporation* testing machine, consists of a powerful windlass purchase, at one end of a rigid cast-iron bench, to the other end of which is arranged a system of two large levers, acting together as one compound lever. It was constructed before 1855 by George Forrester and Co. of Liverpool; INST. OF CIVIL ENGINEERS, *Proceedings*, 1859, xviii, 375. Messrs. W. H. Bailey and Co. of Salford, manufacture testing machines, as Thurston's for torsion; Bramah's hydraulic, for cement, tensile, crushing, and transverse, and for yarn and oil; testers for tensile, torsion, and compression, and other purposes, as paper, wire, cloth, etc.; also test-pumps for steam boilers, kitchen boilers, high pressure, gas fittings, water-works, etc.; Professor Thurston's patent testers for materials of construction; and his patent recording tester; also Tangye's patent hydraulic boiler prover.

There are many well-known American testing machines.

D. Kirkaldy, established 1866, for testing metals and their alloys, stones, bricks, concretes, cements, timbers, etc. Powerful machinery has been adapted for any kind of strain from 10 lbs. to 1,000,000 lbs.; for entire articles, and timbers of full size, up to their ultimate breaking strength; cement, canvas, and wire, up to the greatest strains required for practical purposes. Its capabilities for sizes are as follows:—Pulling stress, any length up to 300 inches. Crushing stress, any length up to 250 inches for columns, etc. For bricks, six of a sort are required for average results. For stones, three or four 6-inch cubes, accurately ground; concrete, usually 12-inch cubes. For cement, half a bushel is required, made up at the works. Bending stress, any span up to 800 inches. For comparing the strengths of full-sized timber or iron joists, 10 feet span is recommended. The results of experiments on full-sized work of every variety of material since January 1866 can be seen in his museum. An apparatus of simple construction is engraved in his *Results—into the Comparative Tensile Strength, etc., of Wrought Iron and Steel*, 8vo., 1862. *University College, Gower Street*; the machine was put down in 1878; made by Greenwood and Batley of Leeds; exerts a pull or power of 100,000 lbs.; takes in test pieces of 6 ft. 6 ins. tension, and 8 ft. 6 ins. compression; description in *ENGINEERING Journal*, Sept. 26, 1879. *King's College, Strand*; the plant consists of two machines; one a Kirkaldy machine, 23 ft. long, taking test pieces up to 4 ft. in length; it exerts a strain of 50,000 lbs.; the other is a Thurston automatic recording machine. A description of the first machine is given in *ENGINEER Journal*, Oct. 5 and 12, 1883. *City of London and Guilds Central Institution*, South Kensington; a 100-ton machine for tension, specimens up to 4 ft. 6 ins. in length; 6 ft. 6 ins. in specimens with eyes; about 3 ft. specimens for compression. The *ENGINEER Journal*, July 25, 1884, shows a nearly similar one. **UNWIN**, *Machines for Testing Materials, especially Iron and Steel*, in *Journal of the Society of Arts*, July 8, 1887; also his *Testing of Materials of Construction*, 8vo., 1888. **W. Harry Stanger**, who has opened a chemical laboratory and testing works at Broadway, Westminster, has a 50-ton machine by Buckton and Co. (Limited), with Wickstead's patent apparatus for measuring and autographically recording stresses from 1 lb. to that of a ten up to 50 tons; with other machines and apparatus for

various purposes. *Messrs. Shaw, Head & Co.*, Queen's Wharf, Bankside, have a testing machine for girders; it is shown in *BUILDER Journal*, 1869, xxvii, 1020. **KENNEDY**, *Use and Equipment of Engineering Laboratories*, at Inst. of Civil Engineers, *Proceedings*, 8vo., vol. 88, p. 1-153.

1. Drain. To test if it be properly connected, so as to find the place of an escape of foul smells into a house, there are three methods. 1. By the paraffin, *peppermint*, or other test, relying on smell. This is effected by pouring say about two ounces of strong (essence of) peppermint down the ventilating or other accessible pipe from the drain outside the house, quickly followed by about two quarts of hot water, the orifice of the pipe being instantly closed to prevent the escape of the scent into the atmosphere. If the scent be observed inside, in any room, closet, or sink, there must be a fault not far away. 2. By the *smoke test*, relying upon sight chiefly, the invention (1883) of Mr. C. Innes, C.E. Straw is to be placed in the drain at some convenient spot, saturated with petroleum, and lighted; the drain must then be covered up to force the smoke up through the ventilating or other pipe; a pin-hole in an iron pipe has been discovered by the issuing smoke, when the previous test failed to point out the spot. Pain's "smoke rockets" burn from ten to fifteen minutes, emitting a dense volume of smoke. The "Banner patent drain grenade", or "drain ferret", is made of thin glass, and charged with powerful pungent and volatile chemicals (*BRITISH ARCHITECT Journal*, 1887, July, p. 96). When the grenade is dropped down any pipe it breaks, and the effect produced by its contents is distributed only as intended. The third test for the proper laying of a main drain is the *water test*, applied by stopping up both ends of the drain which is to be filled with water, and some vertical part formed by which to see if the water be held, or if it escape; James STEWART, sen., in *THE SANITARY RECORD* for Oct. 15, 1883. The defects usually observed in the soil or other discharge pipes when applying the test to them, are insufficient water seal in the traps, open or cracked joints, and the perforation of the lead traps or bends. Sayer's pipe joint tester; and Bailey's pipe and valve testing press, are applicable for this purpose.

TESTACEA SPICATA. Pavements described by VITRUVIUS, as "not having hollows, or rising surfaces, but as rubbed down to a level". From examples at Rome and the villa of Hadrian at Tivoli, it has been considered as a tile pavement, the design and shading of which would lead the eye to suppose it was herring-boned work, having the ridges formed by alternate light and dark sides. *Opus GRÆCANICUM*.

TESTATA (Ital.), means the shortest side of a room, as "testata dell' atrio, dappresso alla cappella del battisterio", of S. Marco, at Venice. **SELVATICO**, *Sulla Architettura*, 8vo., Venice, 1847, p. 190.

TESTER, Teston, Testoon (Old Fr. *teste*, now written *tête*; Ital. *testa*). An old (1360) term for a flat canopy over a chair of state, a bed, pulpit, or tomb. "Capitz" was applied to that over the tomb of Edward the black prince, in Canterbury cathedral. **SPEVER**; *esperver*, *sparver*, and *sperware*. 19.

TESTU. The Latin term for a cask or vat of burnt clay, corresponding to the Gr. *κεραιον*, from *keos* of the Greeks. **MARRYATT**, *History of Pottery*, 8vo., 1868, 3rd edit.

TESTUDO. The Latin term for a light vault of wood, covering halls in baths and mansions, and covered with mortar or cement. They were used at Herculaneum and Pompeii and were destroyed. The peristyle of the forum supported the principal roof, called *testudo*, and rose above the building; *GELL, Pompeiana*, 8vo., 1817-19. *Pompeii*, 8vo., 1831, i, 138. **PHILANDER**, *Vitruvius*, vii, 3, considers that *FORNIX* was a barrel vault, and that "testudo" was the groin.

TETRADORON. According to VITRUVIUS, ii, 3, it was a brick of four palms in length, used for private buildings; the old palm of four digits, or nearly 3 inches, and therefore about 1½ ins. square; **BRICK** (p. 137). It had a half brick made to suit it. **PAIM**.

TETRAPYLON. A square building with an arch on each side, built into houses, at Constantine, Algeria, is so called, in DELAMÈRE, *Expéd. Scient. de l'Algérie* (Archéologie), 4to, 1844, pl. 124. **TETRASTYLE.**

TETRASTOON (Gr. τετρα, four, and στοα, portico). A courtyard with porticos or open colonnades on its four sides. **ATRIUM.**

TETRASTYLE. (Gr. τετρα, four, and στύλος, column). A portico having four columns in front. At Theveste or Tebessa, in Algiers, a quadrifrontal arch was surmounted by two tetrastyles, covered with a *tholus* or cupola, and intended to contain a statue. It dates about the second century A.D.; GRAHAM, in ROYAL INST. OF BRITISH ARCHITECTS, *Transactions*, 1885, p. 150. **TETRAPYLON.** A CAVEAUM was so called when the beams of the compluvium were supported by columns placed at the four angles of the court.

TEULON (SAMUEL SANDERS), F.R.I.B.A., born March 2, 1812, at Greenwich, was articled to George Legg of Bermondsey, was in the office of George Porter, and from 1835-40 exhibited designs with S. Kempthorne. He designed from 1840 a large number of churches, of which that of S. Stephen's (1870) at Hampstead was one of the best; church restorations; the recasting of several modern churches; mansions, as 1850-52 Tortworth court, Gloucestershire, for earl of Ducie; Elvetham, Hampshire, for lord Calthorpe; farm buildings, on the queen's estate at Windsor; many schools and parsonages; and 1866 the Tyndale memorial, 120 ft. high, on Nibley Knoll, one of the Cotswold hills. He died May 2, 1873, aged 61, at his residence, Tensleys, Hampstead, and was buried in Highgate cemetery. He left four sons and four daughters. The memoir in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1873-74, p. 215-8, gives a long list of works in order of date; the one in *Builder Journal*, 1873, xxxi, 384, is in alphabetical order. His brother William Milford Teulon was also in the profession.

TEUTONIC KNIGHTS; order of: or Marian order. This order was instituted in 1192; abolished 1322, and revived 1522 in Prussia. The church of the Virgin belonging to this order at Laybach, was designed 1714 by Domenico de Rossi. The hospital of the Germans, very near the bazaars, at Jerusalem, was the birthplace of this order, this was identified by WIGLEY, from its position in the ancient street of the Germans, and from its particular masonry, which is the same as that of the ruins of the palace of Frederick Barbarossa, at Gelnhausen; WIGLEY, *Archæological Studies*, read at ROY. INST. OF BRIT. ARCHTS., March 10, 1856, p. 104. At Andravida, near Pyrgos, the capital of the French princes, the church of S. Stephen, of this order, can be identified.

TEVARDI, Iverdaj, or Tverdoj, of Spalato (NICHOLAS), designed the upper portion (except the lantern) of the campanile at Spalato, in Dalmatia, erected 1360-1416 to a height of 173 ft.; a bold work. The two lower storeys were built between 1300-23. JACKSON, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1887, p. 173.

TEW; to. To beat mortar; to make it fit for use.

TEWEL. The same as *tuyere*. An old term for a chimney. "In the back of the forge against the fireplace is fixed a thick iron plate, and a taper pipe in it about five inches long, called a 'tewel', or 'tewel iron', which pipe comes through the back of the forge. Into this taper pipe or tewel is placed the nose or pipe of the bellows. The tewel is to preserve the pipe of the bellows and the back of the forge about the fireplace from burning"; MOXON, *Mechanick Exercises* (Smithery), 8vo., London, 1693, p. 2.

TEWERNE, i.e., Tew iron; also tewyrne (1447), toveirne (1473), and tewern (1519), occur in SURTEES SOCIETY, *York Fabric Rolls*, 8vo., 1859.

TEXIER (CHARLES FÉLIX MARIE), born 1802 at Versailles; was appointed 1825 inspecteur des travaux in Paris; 1826 he restored the arch at Reims; 1827 examined the ports of Fréjus and Ostia as to the levels of the sea; was sent 1833 to explore

Asia Minor; Lycia, etc.; 1836 Tarsus, etc.; 1839-41 Armenia, Persia, Babylon, Syria, and Egypt; and 1842 to excavate for the temple of Artemis Leucophryne at Magnesia, the sculptures of which are now in the Louvre museum. In 1845-59 he was inspector-general of works in Algeria. He wrote *Description de l'Arménie, la Perse et la Mésopotamie*, fol., Paris, 1842-52. *Description de l'Asie Mineure*, 3 vols., fol., Paris, 1839-49. *Asie Mineure; des Villes de la Chersonèse d'Asie*, in L'UNIVERS PITTORESQUE, Paris, 1862, xii. With PULLAN, *Byzantine Architecture; Monuments of the Earliest Times of Christianity in the East*, 89 pl., fol., London, 1864; and *Principal Ruins of Asia Minor*, fol., London, 1865. *Mémoire sur la Ville et le Port de Fréjus*, 4to., Paris, 1847. *Mémoires sur les Ports Antiques situés à l'embouchure du Tibre*, 8vo., Paris, 1858. *Edesse et ses Monuments en Mésopotamie*, 8vo., Paris, 1859, in the "Revue Orientale et Américaine". *La ville de Perga en Pamphylie*, in Roy. Inst. of British Architects, *Sessional Paper*, 1863, from which society he received the royal gold medal for 1866, in March 1867; and died 1 July 1871.

TEXIER (JEAN), a native of Beauce or Beaulieu, commenced 1506 the northern spire 378 ft. high (or 403 English ft.) of the abbey church of S. Père at Chartres, and finally completed in 1514. Round the pedestal of a large statue on a gable facing the *parvis*, is inscribed "Jehan de Beauce qui a fait ce clocher m'a fait faire 1513". The screen of the enclosure round the choir, of white stone was begun 1514 by Texier, who died 1529 before it was completed; it was ended about 1539; and again continued 1611-81; WINKLES, *French Cathedrals*, 8vo., 1837, p. 68, 75, 90. LABORDE, *Monuments*, fol., 1816, pl., 254. **CHARTRES.**

TEXT. See LETTER. **LEGEND.**

TEYNTON STONE, Taynton and Tainton. This quarry is situated in Whichwood forest, near Burford, in Oxfordshire. The stone is referred to "the middle division of the great oolite. Its composition and structure are inconstant; when purely oolitic, with few or no shells, it is usually massive and good freestone. When shells become plentiful and range themselves in layers (sometimes oblique), as is shown at Eton college, the stone becomes more fit for rough walling and strong foundations than for house building. This kind of 'ragstone' is like Forest marble, and often is not easily distinguished from that rock"; PHILLIPS, *Geology of Oxford, etc.*, 8vo., London, 1871, p. 150. It is of a brown colour, and weighs 136 lbs. per cubic foot. In the edifices at Oxford, the plinths, string-courses, etc., which are mostly of Teynton stone, are in good condition; as Wadham college, 1610-13; nave 1488 *cir.* of the University church; the library of Merton college 1872; the churches of XII, XIII, and XIV centuries. It was used 1450 at Eton college for the first time, as along the north, south, and east sides of the choir, for the three lowest visible courses of the plinth. It is generally used for the crockets, the deep mouldings extending from them round the buttresses, and for other outer members of the arch-mould of the windows; WILLIS AND CLARK, *Arch. History of—Cambridge*, 4to., Cambridge, 1886, i, 367, 397; 424-6. 1474, etc., the principal part of the stone for S. George's chapel, Windsor, came from Tainton, where Henry Jennings, the master mason, purchased 9,755 ft. at 2d. the foot; TIGHE AND DAVIS, *Windsor*, 8vo., 1858, i, 375. It was also used at Barrington park; Cornubash park; the interior of S. Paul's cathedral; Byland abbey; all of different periods. Stone from many quarries at and near Burford and GREAT BARRINGTON was formerly much used.

TEYSE. 1485, for five teyse of new pavement at 7d. a teyse 2s. 11d.; NICHOLS, *Manners and Expenses, etc.* (S. Mary at Hill, London), 4to., 1797, p. 100. In 1505, 20 Henry VII, Paid to the pavers for paying of xxv tessæ at vijd., xiv. vijd.; Churchwardens' accounts of S. Dunstan in the East; in LAING, *Custom House, etc.*, fol., 1818, p. 39. Some tessæ were found about two feet under the paving, only one being in good preservation; a coat of arms impressed in a mould and then painted—query, a square tile for paving.

TEZCOCO or **TEZCUCO**. A town in Mexico, on the east shore of the lake of the same name. In ancient times it was the second city in the kingdom. In the north-west quarter is a shapeless mass of pottery, bricks, and neatly squared blocks of basalt, supposed to have been one of the palaces of Montezuma. In the southern quarter are the massive remains of three teocalli, of unburnt brick; each being 400 ft. in front at the base. The Mexico of the Incas was built on one of the islands in the lake, which is not now so extensive as at that time. There are the remains of a fine aqueduct in a sufficient state of preservation for general use. The modern town is of some importance, has many good public and private buildings. *IXTLIXOCHITL, Histoire des Chichimeques ou des anciens Rois de Tezcuco, traduite sur le MS. Espagnol par Ternaux-Compan, 8vo., Paris, 1840.* *BULLOCK, Six Months in Mexico, 8vo., 1825, 2nd edit., ii, 118.* **MEXICAN ARCHITECTURE**; **MEXICO**; **TEOTIHUACAN**; **TEOCALLA**. 14. 50.

THABITA; **KLAJB BEN**. See **BEN COLAIB (A.)**.

THACK. A provincial term for **THATCH**. **THEAKE**. "Thacke tyle"; an old term for a plain tile for roofing.

THACKER (ROBERT), calling himself "designer to king Charles II" (1660-85), engraved a large print on a plate of four sheets of the cathedral at Salisbury. *WALPOLE, Anecdotes, edit. 1864, p. 921.*

THAL. Wimpfen in Thal, a town near Gall, in Switzerland, having an old stiftskirche, built 1262-78, by a "very skilful mason, lately arrived from Paris"; "opere francigeno." 92.

THALAMOS. A chamber. In Priam's palace were fifty thalamoi of polished stone or marble where his sons slept; twelve more where his daughters slept; he had a cedar thalamos where he kept his treasures; other instances occur in *INWOOD, Erechtheion, fol., 1827, p. 55-6*. At the foot of the hill Deeras, at Argos, was a subterranean building which is said to have once contained the brazen chamber (thalamos) in which Danaë was confined by her father Acrisius; *SMITH, Dict. of Ancient Geog., p. 205-6*; *BLOUET, Morée, fol., Paris, 1834-6, ii, pl. 55-60*. The thalamus of Amphitryon and Alcmæna, at Thebes, in Boeotia, was built by Anchiasius with Trophonius and Aganædes; *PAUSANIAS, ix, 11.*

THAMES BALLAST. The red ballast was obtained in dredging the river Thames between Westminster bridge and Hammersmith on the south side. Average contents of a load, stones 35½ bushels, and sand 20½, equal to 56 bushels. The black ballast was obtained between Westminster bridge and London bridge, and generally runs 40 and 20 equal to 60 bushels per load. *GODWIN, Essay on Concrete in R.I.B.A., Transactions, 4to., 1836, i, p. 20*. An equivalent is composed of three or four parts of sharp stones and one of sand, the sieve for the latter having wires one-eighth of an inch apart. This ballast is specified to be mixed with lime or cement for concrete. **BALLAST**.

THAMUGAS, and **Tamugadas**, the modern **Timegad**. A site of a town of the age of the Antonines, 138-180, and presenting more points of interest to the architect than any other in Algeria. The French explorers under prof. Masqueray in 1875 opened up a large portion of the forum, 162 ft. by 145 ft., a theatre behind it, an arch to Trajan, a temple to Jupiter Capitolinus 85 ft. by 125 ft., the *curia* or senate house with a tribune; *GRAHAM, in Roy. Inst. of British Architects, Transactions, 1884-85, p. 148-9*, and plates. The triumphal arch is one of the finest of the series in north Africa, from its size and design; it is of the Corinthian order. There is also a prostyle portico of a temple standing on a stylobate with a flight of steps up to it. *DONALDSON, Playfair's Travels on the Footsteps of Bruce, read at Roy. Inst. of Brit. Archts., Sessional Papers, 1876-77, p. 40.*

THANKE. "William of Wickam — was surveicour of the king's workes, which is the very cause (as I conjecture) that some have ascribed to him the thanke of the building it selfe" (Queeneboroughe castle, Kent). *LAMBARDE, Perambulation of Kent, 1570-6, 8vo., 1826, p. 227.*

THARROS. The ruins of an ancient Greek town to the

ARCH. PUB. SOC.

north of cape S. Marco, in Sardinia. The old abbey church of S. Giovanni di Sinis is not of much interest. On the promontory of Sinis are upwards of twenty *nurhags*. *PETTIGREW, Discovery of Tharros, by G. Spano, in Journal of ARCHEOLOGICAL ASSOCIATION, 8vo., 1852, vii, 240-58.* 28.

THASOS. An island in the Aegean sea. *SENECA, Ep. 86*, referring to the luxury of his time (*cir. 50 A.D.*), says, "even the poor expected Thasian marble in the public baths." Two images of Hadrian (emperor 117-38), of Thasian stone, were before the temple of Jupiter Olympius at Athens; *PAUSANIAS, 14. 50.*

THASUS, in Phœnicia. A temple was seen by *HERODOTUS* said to have been built by the Phœnicians at a very early period. 23.

THATCH (Fr. chaume). A roof-covering of wheat straw in several layers to the depth of twelve inches, solidly bedded, the first layers on strong laths of riven oak secured to rafters (called "caber" in north of England), with iron hooks, and the upper coat fastened to that with wooden pegs, and excepting for its inflammability and liability to decay, it is the best roof-covering ever used, being from its non-conducting qualities cool in summer and warm in winter. **THACK** is the provincial term for **thatch**. **THEAKE**. But **thatch** should not be less than 14 ins. thick, and it will be more permanent if 18 ins. **Thatch** has been much used in the counties of Norfolk, Suffolk, and Lincolnshire, and occasionally in Cambridgeshire, Cheshire, and Yorkshire, for the covering to churches. A long list may be compiled from *NOTES AND QUERIES Journal*, 3rd Ser., xi, 517; xii, 35, 75, 100. 6th Ser., ii, 447; iii, 56; iv, 117; v, 174; vi, 117. The custom probably arose from the ease with which reeds were and still are procured in the great marshes.

Thatch is of two kinds, one with haulm, or straw that has not been thrashed, but the sheaves of wheat first combed with an iron-toothed comb made for that purpose, and cleared from all short straws, from weeds and grass, and then the ears cut off with a sharp sickle; the other with straw that has been thrashed. The first requires eight sheaves, 1 lb. rope yarn, 100 *6d.* nails, 100 of 3 ft. laths = 1 sq.; lasts 25 to 30 years. The second: a ton of straw = 6 sq., lasts 12 or 14 years, each square about a day's time for thatcher and boy; *WOOD, Cottages, 8vo., 1788, p. 21*. Another writer gives for each square, two-thirds load of straw, one bundle of laths, 40 withes or a pound of rope yarn, 40 thatching rods, and 200 nails; *SALMON, Vade Mecum, 8vo., 1755, p. 59*. A load of haulm worth 30s. will do six squares in Oxfordshire. "Thatched house nuisances", in *LOUDON, Suburban Gardener and Villa Companion, 8vo., 1838*, and *CIVIL ENGINEER, ETC., Journal, 1838, i, 346*. *LOUDON, Villa and Cottage Architecture, § 122*. *ANDREWS, Agricultural Engineering, 12mo., 1852-53, i, 132*. *AIDE MÉMOIRE, s. v. Hut, p. 266*. The "straw thatch weaving-machine" effects a great saving in the consumption of straw. The *Report of the "Select Committee on Fire Protection", 1867, § 1523 and 4871*, mentions Acts of Parliament against the use of thatch, and the dangers from fire. Londoners in early times were compelled to whitewash the thatch—observed to this day in Wales, in which country plastered thatches are of ordinary occurrence; *TURNER AND PARKER, Dom. Arch., 8vo., 1853, ii, 26*; who i, 72, state that the roof of the chapel at the royal manor of Kennington 1236 was replaced by a certain light roof of laths covered with thatch or straw, from *Rot. Pip. 20 Henry III*. It has been stated for many years (since 1843), that if straw be saturated with a solution of lime, or even common whitewash, it will prove not only to be incombustible but more durable than the ordinary thatch. **THEAKE. THEKYNG.** 1. 14. 25.

A peculiar mode of thatching carried on at Kilmarnock, in Ayrshire, where slate is expensive, has the roof thatched as usual, only lime mortar very well prepared and mixed with cut straw is thinly spread over the straw with a large trowel made for the purpose. A thatcher requires two men to serve him with straw, a third to prepare the mortar, and a fourth to carry it up. When well done this covering will last 40 or 50 years,

K

and when it begins to fail, it is easily repaired. Clay answers nearly as well. Reeds are the best of all thatch, as they will last without repair 20 or 30 years; FORSYTH, *Beauties of Scotland*, Svo., Edinb., 1808, ii, 461. Mr. J. K. Boswell described a cheap substitute for thatch, consisting of "scraws or sods" covered with a composition about 2 ins. thick, somewhat similar to the above process; CIVIL ENGINEER, ETC., *Journal*, 1855, xviii, 249, before Royal Dublin Society.

Reed. Sea or marsh reed. "The general cost for reed and workmanship and everything complete, is a guinea a square. No covering is so good as this, as it will preserve a roof twice as long as tile. Where straw is used for thatch, I earnestly recommend the excellent practice of the west of England, where the straw is combed quite clean of weeds, the ears of the corn cut off, and reed (as it is called) laid on in whole pipes, unbruised by the flail. The consequence is, that it is twice as durable, and in appearance much better"; BARTELL, *Hints*, Svo., London, 1804, p. 17. *RUSH.* A bundle prepared for thatching is termed a "bolt". In 1880 it cost 30s. per square near the reed beds. In 1828 it cost 38s. per square for everything found. The month of May is recommended as the proper season for repairing such roofs.

"Where houses be reeded (as houses have need),
Now pare off the mosse, and go beat in the reed:
The juster ye drive it, the smother and plaine,
More handsome ye make it, to shut off the raine."

Tusser Redivivus, 1744.

The reeds of Marshland, Norfolk, constitute a very durable and neat thatch for houses, and are said to last from 30 to 40 years. Thatching is executed in the county of Norfolk in a style altogether superior to many other places; NORFOLK TOUR, Svo., 1829, i, 371. "A roof thatched with Lincolnshire reeds would last seventy years", confirmed 1773 by a great thatcher in London; BOSWELL, *Life of Johnson*, chap. xl.

Heather roofing (Fr. *bruyère*). A common covering in Scotland, and by some persons considered superior to straw. It is begun at the eaves, a layer laid, and then a second one, the roots of each being twisted together and so on to the top; when both sides are done, the roots are secured to the rigging by well-wrought clay, which in general is covered with "divots". When well executed a roof is not disturbed by the most violent wind; SCOTS MAGAZINE, 1772, xxiv, 251. In Dumbartonshire, *heath* (*erica vulgaris*), or breckins fern (*pteris aquilina*), properly managed are very durable; the heath is cut before harvest and laid on stem downwards; breckins are pulled up by the roots early in October; the leaves dry, not withered; placed with the roots downwards in rows about 3 or 4 ins. distant, so that nothing but the root is exposed. On the sunny side this lasts about six or seven years, on the northern side upwards of 30 or 40 years. Breckins exposed to the sun grow brittle and moulder down. FORSYTH, *Beauties of Scotland*, Svo., Edinb., 1808, iii, 341-2. 1.

In America, thatching is done with the leaves of the Agave Americana; the "maguay" or "chagarquero" is used to houses at Quito, in Ecuador. The unopened leaves (*palla branca* or white thatch) of the *ATTALEA speciosa*, of the Upper Amazon, are preferred to other palms though requiring more preparation: the (*bussú*) leaves of the *Maicaria saccifera* are also used. The leaves of the *Borassus flabelliformis*, Palmyrah palm, of Ceylon, are there used. 50.

THATCHER (Lat. *arundinarius*), or reed coverer.

THATUN; in Burnah. The principal pagoda is of hewn laterite, 104 ft. square and 18 ft. high; the second story 70 ft. square and 16½ ft. high; the third 48 ft. square and 12 ft. high; on which now stands a circular pagoda making up the whole height to 85 ft. It is a fact that here are three-storied pagodas, which certainly were erected before 1080, when the city was destroyed, and probably before the VI century, when it was practically superseded by the rise of the new city and kingdom

of Pegu; FERGUSON, *Indian, etc., Arch.*, Svo., London, 1876, p. 613, 618.

THEAKE. Queen Elizabeth passed a decree, that "no person theake or cause to be theaked any house, tenement, or stable in Kingston-upon-Hull in part or in all with straw, reade, hay, or otherwise than with theake-tyle under penalty of ten pounds"; *BUILDER Journal*, 1861, xix, 453. **THATCH.**

THEATINE ORDER. A regular clergy, founded 1524 by John Peter Caraffa, afterwards pope Paul IV (1555-60) and so called because he had been archbishop of Teate Apulum, now Chieti, in the former kingdom of Naples. It was established 1644 at Paris. The order vainly endeavoured to restrain the luxury of the clergy, and to revive the simplicity and poverty of the apostles. 14.

THEATRE (ANCIENT). The Lat. *theatrum*, from the Gr. *θεάτρον*, a place for seeing. A word adopted to signify a building appropriated to dramatic representations. The earliest theatres at Athens and Rome were of timber. The Greek theatres were partly cut out of the rock. The only instances known of a Greek theatre built in a plain are those of Mantinea and Megalopolis in Greece; and a small one near Arabi Hissar, probably Alabanda, or Labranda, in Asia Minor. Both at the great theatre and amphitheatre at Pompeii, the women's gallery had compartments like boxes, and also at the great theatre, a light screen of metal-work. At Syracuse, and at the Tragic theatre at Pompeii, the backs of the seats were a little raised to prevent toes kicking the backs of the spectators. The theatre at Syracuse had poles for a velarium; also the larger theatre at Pompeii. The theatre at Nicæa cost more than 10 million sesterces or about £87,729 of English money: an enormous sum in those times; PLINY, writing to Trajan. The first permanent one at Rome was built by Pompey and completed in 69 B.C. The most celebrated were those of Scæurus and Curio, minutely described by PLINY; the next was by Augustus, and called Marcellus, which held 30,000 persons; and Cornelius Balbus, all three at Rome. The Greeks used three squares for proportioning the orchestral portion; at Patara the curve of the orchestra, or coilon, is struck from three centres; the semicircle was a feature of the Romans who formed the orchestra by four triangles. At Priene the lateral walls were parallel to each other, the end enclosure wall of the coilon being circular. At Syracuse, the extremities of the coilon are not parallel to the scene (an error in LEAKE, p. 322). At Patara, Myra, Side, Tadmirus, Miletus, Hierapolis, Laodiceia, Epidaurus, and several other smaller theatres, the ends of the coilon or cavea diverged from the orchestra so as to form an oblique angle to the direction of the scene. At Segeste, Syracuse, Sparta, Dramysus, Sicyon, Tauromenium and Athens (Herodes), both Roman, the extremities of the coilon or cavea were parallel to the scene. In the Latin theatre, the wall of the cavea was parallel to the wall of the scene in Asia Minor; only two examples, Nicæa and Aspendus. The scene at Laodiceia ad Lykos, Nicopolis in Epirus, and Hierapolis, have a large niche in the centre. At Sardes 396 ft.; Tralles 540 ft.; Magnesia ad Mæandrum, and Pergamum, the theatre was placed on one side the stadium. Smaller theatres were sometimes roofed, as the lesser one at Pompeii; and those by Herodes Atticus at Athens and Corinth (Roman).

The above, with other theatres, will be found noticed in this work, many with dimensions, and other information. The following are considered the more important. **AMPHITHEATRE. ODEION.**

Theatre.	Ext. diam.	Orchestra.	Remarks.
Dramysus (Joannina),	445	121	} Very perfect.
Turkey in Europe.	440	78	
	430	120	
Aspendus; Asia Minor	409	71.2	} Best preserved in the world. Roman.
Miletus; Ionia ...	472	224	
Ephesus (Aiosoluk), ...	660	240	} Wood says 24,500 seats.
Turkey in Asia.	495	—	
	467	—	

Theatre.	Ext. diam.	Orchestra.	Remarks.
Megalopolis; Moron...	480	—	Very perfect. Date about B.C. 371. Greek.
Syracuse, Sicily ...	440	116	About 24,000. Date about B.C. 470.
Argos; Morea ...	450	200	} 13,000 to 20,000. Imperfect. Greek.
	435	217	
	435	217	
Sparta; in the Morea	453	217	} Considerable remains.
	430	170	
	418	140	
Tralles (Guzel hissar), Turkey in Asia ...	540	150	On one side of the stadium.
Athens; Dionysus ...	288.8	36.1	30,000. Commenced B.C. 437.
" Bacchus ...	250	72	Discovered 1862.

The oldest writer on theatres now remaining is VITRUVIUS, *De Architectura*, B. 5, ch. 3-9; and preface vii. POLLUX, *Onomasticon*, B. iv, ch. 19. BULINGERUS, *De theatro Iulio Secviciis*, 8vo, Tric., 1603; a compendium by BOINDIN for Académie des Sciences, etc., *Memoirs*, ii; also in his *Œuvres*, ii, 8vo., Paris, 1753. An abridgment in *Ragionamento sopra la forma e la struttura del teatro Antico*, 4to., Ven., 1766. CHOISEUL-GOUFFIER, *Voy. pitt. de la Grèce*, fol., Paris, 1782-1809, gives two theatres. MILLIN, *Dictionnaire des Beaux-Arts*, 1806. GALLIANI, in his edition of VITRUVIUS, was the first to elucidate the true form of the orchestra from the three centres, but has erred with others in its size. The *Ionian Antiquities*, fol., London, 1769-97 (also 1840, 1882), gives three plans in Asia Minor; while in BEAUFORT, *Karamania*, 8vo., London, 1817, and LEAKE, *Asia Minor*, 8vo., London, 1824 (p. 320-9; 345), are plans by C. R. Cockerell. GENELLI, *Das Theater zu Athen*, 4to., Berlin, 1818, supplied material to CAMPBELL, in NEW MONTHLY MAGAZINE for January 1826. KANNIGESSER, *Die alte Komische Bühne in Athen*, 8vo., Breslau, 1817. SCHLEGEL, *Lectures on Dramatic Art*, transl. by BLACK, 8vo., London, 1815. The above is condensed from DONALDSON, *On form, etc., of the Greek Theatre*, in STUART, *Athens*, 1840, iv, 34, who gives plans of the theatre at Epidaurus; at Drameyssa near Joannina, in Albania; and Syracuse. The Greek and Roman theatres are also described in POMPEII, 8vo., 1831, i, 211; 230; 243. ROUSOPOLOS, plans, etc., of Dionysiac theatre at Athens, by Ernst Ziller, in ARCHAIOLOGIKE EPHIMERIS of the Archeological Society of Athens. At Vicenza, Palladio reproduced an ancient theatre according to the description in VITRUVIUS; MONTENARI, *Del teatro Olimpico*, 8vo., Padua, 1733; 1749; 1752.

SERLIO, *Architettura*, fol., 1540; one between Fondi and Terracina, with Marcellus, Pola, Ferento. MONTENARI, *Sopra gli antichi teatri*, 8vo., 1735. MARTINI, *Theatro Saguntino*, in POLINI, *Sup. ad Græv. Thes. Antig.*, v. MINIANA, *idem*, in *idem*. BOCCHI, *Antico teatro scoperto in Adria*, 4to., Venice, 1739. Pozzo, *Sopra i teatri degli antichi*. HOUEL, *Voy. pitt. de Naples et de Sicile*, fol., Paris, 1782. PIRANESI, *Teatro d'Ercolana*, vol. 19 of *Opere*; and in vol. 4 of *Opere*. STUART and REVETT, *Antiq. of Athens*, fol., 1794-1816, gives that of Bacchus, now the Odeium. VAUDoyer, *Descr. du théâtre de Marcellus à Rome*, 4to., Paris, 1812. BIANCHI DI LAGUNO, *Arena e sul podio del anfiteatro Flavio*, fol., 1812. AZEVEDO, *Antigo theatro Romano descoberto in Lisboa*, 4to., 1815. PATTE, *Saggio sul Architectural teatrale*, 8vo., 1830. FASO (Duca di Serradifalco), *Antichità della Sicilia*, fol., Palermo, 1834-42. CARISTIE, *Théâtres antiques d'Orange et d'Arles*, 4to., 1839. BECCHI, *Plan escavé à Posilippo*, fol., 1843. TEXIER, *Asie Mineure*, fol., Paris, 1839-49. HOGG, *Theatre, etc., at Acree*, in MUS. OF CLASSICAL ANTIQ., 8vo., 1851, ii, 240. FALKENER, *Theatres and other remains in Crete*, 8vo., 1854. TEXIER and PULLAN, *Principal Ruins of Asia Minor*, fol., London, 1865, gives Aizani, Aspendus, and Myra. LLOYD, *Early Theatres*, in *Age of Pericles*, 8vo., 1875, i, 239. GRAHAM, *Roman Occupation of North Africa*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1885. ENCYCLOPEDIA BRITANNICA, ninth edition, 4to., 1888.

The various parts of the ancient theatres are explained s. v.: BRONTRUM. COLON or CAVEA. CORRIDOR. CHORAGIUM. CUNEI. DIAZOMA. ECHELA. EPISCENIUM. GRADUS or seat. HYPOSCENIUM. LOGEIUM. ORCHESTRA. PARASCENIUM. PODIUM.

PORTICUS. POSTSCENIUM. PRÆCINCTIO. PROSCENIUM or stage. PULPITUM. SCENA or SKENE. THEOLOGEION. THYMELE. VELARIUM. VESTIARIUM. VOMITORIUM. 1. 2. 6. 7. 14. 25. 78.

Modern Theatres:—

The number of modern theatres and opera houses is now 1888 enormous. In Europe: total in 1866, was 1,584 (also 1869). In France 337 (337); Italy and Venice 348 (298); Spain 168; Great Britain 150 (160); Austria 150 (152); Germany and Prussia 191 (115 + 76); Russia and Poland 44; Belgium 34; Holland 23; Switzerland 20; Sweden and Norway 18; Denmark 15; Portugal 16; Turkey 4; Greece 4; Roumania 3; Servia 1; (Paris 40). In London 1866 there were 25 accommodating 41,000 persons; and 40 in 1877. "List of theatres" in Great Britain, Australia, America, Paris, etc., in *Era Almanack* for 1869; that for 1889 gives 252 in Great Britain, including 35 in London. There were 927 theatres in Italy at end of 1869 distributed among 690 towns and communes.

Lists of theatres destroyed. PATTE, *Essai sur l'Architecture théâtrale*, 8vo., 1782. WARE, *Theatres*, 8vo., 1809, p. 2. TEGG, *Dict. of Chronology*, 8vo., 1854. *All the Year Round*, July 1861, p. 380. WALFORD, *Insurance Cyclopaedia*, 4to., 1871. Report of "Select Committee on the Fire Brigade and means of preventing Fires in Theatres, etc.", London 1877. In 1882, forty-one burnt, *ARCHITECT Journal*, Jany. 1883. During the last ten months of 1866, nine first-class theatres were burnt in the United States. *On Fires*, and *On Fires in Theatres*, two papers by WALFORD and MACMILLAN, read at SOCIETY OF ARTS, *Journal*, 8vo., 1883. SHAW, *Fires in Theatres*, 8vo., 1876. Articles in *GLOBE Newspaper*, September 1887. EMDEN, *Theatres and Fireproof Construction*, 8vo., 1888.

Parts of a modern theatre are explained s. v.: AMPHITHEATRE. BALCON. BOX. CRUSH ROOM. GALLERY. JUTTY. LOGES. PARADIS. PARQUET. PANTERRE. PIT. PROSCENIUM. SALOON.

It is considered best not to enter on the arrangements for a theatre, the whole question being still under consideration (1885-8) since the destruction by fire of the Ring theatre at Vienna, and others. The several journals record the individual schemes put forward as favourable improvements.

- Berlin - KNOBELSDORF, *Salle de l'Opéra*, fol., Berlin, 1758. KAMMERLING, *Das Victoria-theater*, fol., Berlin, 1861. LANGHAUS, *Das Victoria-theater*, fol., Berlin, 1861. TITZ, *Das neue Victoria-theater*, fol., Berlin, 1861.
- Breslau - *La nouvelle Salle de Comédie*, 4to., Berlin, 1783.
- Bologna - *Nuovo teatro*, fol., Bol., 1763; said to be brick-vaulted.
- Bordeaux - LOUIS, *Salle du Spectacle*, fol., Paris, 1782. Theatres by DETCHEVERRY, 1860.
- Dieppe - FRISARD, *Théâtre*, 8vo., Paris, 1827.
- Dresden - SEMPER, *Königliche Hoftheater*, fol., Brauna., 1849.
- Hamburg - SCHINKEL, *Theater*, fol., Berlin, 1828.
- Imola - MORELLI, *Nuovo teatro*, fol., Rome, 1780.
- London - WYATT, *Drury Lane Theatre*, 4to., 1812, 1813. SMITH, *Fall of the Brunswick Theatre*, 1828.
- Milan - PIERMARINI, *T. della Scala*, fol., Milan, 1789. *Nuovo Sipario dell' teatro della Scala*, fol., Milan, 1821.
- Moscow - CAYOS, *Grand Théâtre*, fol., 1860.
- Paris - GARNIER, *Nouvel Opéra*, text 2 vols., 60 pl., 6 vols., lar. fol., Paris, 1877-81. MUTTER, *Nouvel Opéra*, 63 pl., 12mo., 1875. DALY ET DAVIoud, *Théâtre impérial du Châtelet*, fol., Paris, 1871. MAGNE, *Mon. du théâtre du Vaudeville*, fol., Paris, 1871. DONNET ET KAUFFMANN, *Architectonographie des théâtres de Paris*, 8vo. and 4to., Paris, 1837.
- Parma - TOSCHI, *Il nuovo teatro*, fol., 1829.
- Rome - SANGIORGI, *Idea d'un teatro — nelle strade del Corso*, fol., Rome, 1821.
- Tor di Nino - GIORGI FELICE, *Des. istorica del teatro di T.*, 4to., Rome, 1795.
- Turin - ALFIERI, *Teatro*, fol., 1741.
- Velletri - *Theatre of the Confratelli della Passione*, xv cent., found in 1765, SEROUX D'AGINCOURT, *Arch.*, pl. 55.

A "Table of Modern Theatres" is also given in PENNY CYCLOPEDIA, 1842, s. v. For illustrations given in journals, etc., see the towns, etc. 1. 2. 3. 6. 7. 14. 25.

CARINI, *Trattato sopra la struttura de teatri, etc.*, fol., Guastella, 1676. ARNALDI, *Idea di un teatro*, 4to., Vicenza, 1762. DUMONT,

Parallèle de plans des plus belles Salles de Spectacles d'Italie et de France, etc., fol., Paris, 1774. ROUBO, *Traité de la construction de Théâtres*, etc., fol., Paris, 1777. NOVERRE, *Construction d'une Nouvelle Salle d'Opéra*, 8vo., Paris, 1781. PATTE, *Essai sur l'Architecture théâtrale—des principaux théâtres de l'Europe*, 8vo., Paris, 1782; and Milan, 1830. LAMBERTI, *La regolata Costruzione de' Teatri*, 4to., Naples, 1787. CAPI, *Opera del Teatro antico e moderno*, Ven., 1789. RICATI, *Costruzione de Teatri, secondo il Costume d'Italia*, 4to., Bass., 1790. SAUNDERS, *Treatise on Theatres*, 4to., London, 1790, plans taken from Dumont's work. DURAND, *Recueil et Parallèle des Edifices de tout genre, anciens et modernes*, fol., Paris, 1800. BOULLET, *Essai sur l'Art de construire les Théâtres*, etc., 4to., Paris, 1801. WARE, *Theatres and on the propriety of Vaulting them with brick and stone*, etc., 8vo., London, 1809. LANDRINI, *Osservazioni sui difetti prodotti nei Teatri*, etc., 4to., Milan, 1815. BECCEGA, *Sull' Arch. Greco-Romano applicata alla costruzione del teatro moderno Italiano*, fol., Venice, 1817. KRAFFT, *Charpente*, fol., Paris, 1819-22, and supp. by THIOLETT, fol., 1840. WELLER, *Theaterbaukunst*, 4to., 1829. FERRARIO, *Descr. di principali teatri antiche e moderni*, 8vo., 1830. STRACK, *Das Altgriechische Theatergebäude*, fol., Potsdam, 1843. CAVOS, *Traité de la Construction des Théâtres*, 8vo. and fol., Paris, 1847; Leipzig, 1849. LACHEZ, *Acoustique et Optique des Salles de réunions publiques*, etc., 8vo., Paris, 1848. CONTANT ET FILIPPI, *Parallèle des principaux Théâtres modernes de l'Europe, et des machines*, fol., Paris, 1859-60. GOSSET, *Construction des Théâtres*, fol., Paris, 1886.

Machinery, Scenery, etc., of a Theatre. SABATTINI, *Pratica di fabbricar Scene e Machine ne Teatri*, 4to., Rome, 1638. FURTENBACH, *Architectura Recreationis; scenery*, etc., fol., Augs., 1640. NOLFI, *Il Bellorofonte*; pl. of scenery, designed by G. Torelli, fol., Venice, 1642. COPPOLA, *La Nasse degli dei Favola*, 4to., Firenze, 1657. BOCKLER, *Theatrum Machinarum novum*, fol., 1662. CHIARAMONTI, *Delle scene e teatri*, 4to., Cesena, 1675. MOTTA, *La Struttura de Teatri e Scene*, fol., Guast., 1676. BIBIENA, *Varie Opere*, fol., cir. 1720. GALLIARI, *Décorations de Théâtre*, fol., Milan, cir. 1750. MOULIN, *L'Art de décorer les Théâtres*, 8vo., 1776. DUMONT, *Parallèle*, etc., détails de Machines, fol., Paris, 1773-4. ROUBO, *Traité—des Machines*, etc., fol., Paris, 1776. BOULLET, *Essai sur—Machines*, etc., 4to., Paris, 1801. *Raccolta di Prospettive serie, Rustiche*, etc., about 100 pl., obl. fol., Bologna, 1810. FONTANESI, *Decorations for Theatres; Scenery*, fol., 1813. LANDRIANI, *Osservazioni sui difetti prodotti nei teatri dalla cattiva Costruzione del Palio Scenico*, etc., 4to., Milan, 1815. BECCEGA, *Sull' Arch.*, etc., e sulle Machine teatrali, fol., Venice, 1817. BORGNI, *Des Machines imitatives et des Machines théâtrales*, 4to., Paris, 1820. VACCANI, *Raccolta di abitazione—la decor. de teatrali*, fol., 1832. DONNET ET KAUFMANN, *Théâtres—depuis 1820, machines*, etc., 4to., 1840. CONTANT, *Théâtres Modernes—systèmes de Machines*, etc., fol., 1842. STEPHENSON, *Patent Theatre Machinery*.

THEATRIDIUM. The name given to the arena or stadium in the Thermæ of Caracalla, in which youths performed their exercises, with seats for the spectators.

THEATRON; see **ODEION**.

THEBAID MARBLE; see **BRECCIA**, **GRANITE**, and **PORPHYRY**. The latest particulars are contained in the paper by BRINDLEY, *Ancient Quarries of Egypt*, read at ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1887, p. 5-26, describing the recovery of the porphyry quarries lost to sight for 1,500 years.

THEBES. The chief city of Boeotia, now Thiva in Livadia, in Greece. It is situated on an isolated hill thirty miles north-west of Athens. It was one of the most celebrated cities of ancient Greece, and HOMER refers to its seven gates, hence its name Heptapylos; but a few marble columns alone remain (**ANCHASUS**). The modern town is chiefly built of timber, and has four Greek churches and three khans. LEAKE, *Northern Greece*, 8vo., 1835, ii, 218; iv, 573. ULRICH, *Top. von Theben*, in *ABHANDL. DER BAYER. AKADE.*, 1841, p. 413; UNGER, *Theban*

Paradoxa, 1839. FORCHHAMMER, *Topog. Thebarum Heptapy-larum*, Keil, 1854. 23. 50.

THEBES. A great city in Upper Egypt, and one of the grandest in ancient history; the capital of the united kingdom of Upper and Lower Egypt (removed from MEMPHIS). It was the seat of empire of the XIth, XIIth, XIIIth (ancient), and XVIIIth, XIXth, and XXth (or new) Egyptian dynasties (cir. B.C. 2300—cir. B.C. 1200). Thebes was called *Ous* in Egyptian, and *Ta-pe* (*Tôpe*) "the head", in Coptic, and was divided into several districts. Its chief deities were Amen Ra, Maut, and Khonsu. It was also called Diospolis magna, answering to Amenei, or Ammon-no, the abode of Amen, the Jupiter of the Egyptians. The city stood on the east and west sides of the river Nile, the western portion being called Pathyris, Tatharis or Tathyris, and Pathros, being under the protection of Athor. Its circuit was put at 80 or 140 stadia; the epithet Hecatom-pylos of Homer is supposed to have referred to the propyle of the numerous temples, as there were no walls. It had attained to almost unexampled prosperity until it lost importance by the seat of government being transferred to Bubastis by Sheshonk, and then to Tanis. It was plundered and partly ruined in the VII century B.C. by the Assyrians under Assurbanipal, who removed two obelisks from a temple there to Nineveh. During the invasion of the Persians under Cambyses B.C. 527 it was captured and pillaged; and its destruction completed by Ptolemy Lathyrus (B.C. 117 or 107), who after a three years' siege left it a heap of ruins. The chief overthrow of the buildings appears to have been due to an earthquake of B.C. 27. Many of the works are still in wonderful preservation. The present sites of various parts of "Thebes" are known as i. Koorneh, Goorna, or Goorneh: II. Medeenet Haboo, or Medinet Abu: III. The tombs of the Kings and tombs of the Queens; all these being on the western bank of the Nile: and IV. Luxor: and V. Karnak, situated on the eastern bank; they will here be taken in that order. The edifices in order of date will be found s. v. **EGYPTIAN ARCHITECTURE**. General descriptions of these structures are given s. v. **TEMPLE**, and need not be again repeated.

Works on the west bank of the river. The Setheum, Rameseum, and the temple of Rameses III are now considered to be funeral temples erected by the monarchs in the plain before their sepulchres. I. KOORNEH has a small temple founded by Sethi I, and completed by his son Rameses II (Sesostris of the Greeks). It has a central hall 57 ft. long, with numerous chambers dilapidated. Beyond it is the *Rameseum*, or temple of Rameses II (erroneously called the Memnonium and the tomb of Osymandyas); "for symmetry of architecture and elegance of sculpture, this edifice may vie with any other Egyptian monument." The peristyle is 180 ft. by 220 ft. wide. By the side of a flight of steps leading to the next court are the ruins of a stupendous seated statue of Rameses II, of syenite, probably weighing over 1,000 tons. The second area of Osiride pillars is about 140 ft. by 170 ft. Three flights of steps lead up to the great hall, 100 ft. by 133 ft., which has six columns (32 ft. 6 ins. high without the abacus and 21 ft. 3 ins. circumference) on each side of the central avenue, and behind these are eighteen columns on each side, 17 ft. 8 ins. circumference. Beyond these are three central chambers, the two first with columns, having three other chambers on each side. MARIETTE, *Monuments*, 1877, p. 189-195. Near this to the west are two broken statues of Amenhotep III, about 35 ft. high, 5 ft. 3 ins. across the shoulders. About 700 ft. south is the Kom el Hettan or mound of sandstone, the site of another temple to Amenhotep III, which must have held a high rank among the finest monuments of Thebes. A dromos of 1,100 ft. extends to the two sitting monolithic colossi of Amenhotep III, which with the pedestals must have stood 60 ft. above the plain; the figures alone are 50 ft. high, and measure about 18 ft. 3 ins. across the shoulders. They are supposed to have been destroyed in the great earthquake of B.C. 27; and repaired by layers of sandstone by Septimius Severus (A.D. 193-211). There are the

remains of many other colossi partly buried. ZINCKE, *Egypt*, 1871, p. 143. LETRONNE, *Account of the Greek and Latin Inscriptions on the two Colossi; Rameses II the Great*, in EDWARDS, *Up the Nile*, 8vo., 1877, ii, 385. F. DE LAMOYE, *R. le Grand, ou l'Egypte il y a 3300 ans*, 8vo., 1872.

II. MEDEENET HABOO. A small temple to Thothmes III, has a court 80 ft. by 125 ft., having the names of Autocrator to Eusebes. Various courts succeed, leading to the original edifice composed of an isolated sanctuary, with pillars around, founded by Amen-noo-het or Hatasoo. The palace of Rameses III, of which the south or front part consists of towers and courts and chambers, many destroyed, but interesting as showing the internal decorations of an Egyptian palace. From this a dromos of 265 ft. led to the great temple dating 1311 B.C. The central opening of the pylon led into two courts with pillars having Osiride and papyrus capitals. The second court is one of the finest in Egypt, being 123 ft. by 133 ft., and 39 ft. 4 ins. high to the cornice, having Osiride pillars all round it. The colouring is still vivid. Further on are a hall of columns, two smaller columnar halls, and the sanctuary, having on either side of them an immense number of small chambers. The exterior of the building is noted for the lions' heads serving as spouts to carry off the rain from the roof; long pieces of stone were let in over the joints of the slabs to prevent rain passing through. The sculptures and paintings are of great historical interest. Near it is a small Ptolemaic temple dedicated to Thoth, of sandstone. A low plain, called *Birket haboo*, 7,300 ft. by 3,000 ft., was formerly a tank over which the dead were carried. At some distance south-west is a small temple bearing the names of Hadrian and Antoninus Pius (117-160 A.D.); it has a staircase.

The *Dayr el Medeenah* is a small temple erected to Ptolemy Philopator, 60 ft. by 33 ft.; completed by Physcon or Euergetes II, and Dionysius. A staircase has a window of peculiar form. Dove-tailed cramps of sycamore wood connected the blocks of masonry. The bricks in the walls surrounding the temple are laid in concave and convex courses along the whole length.

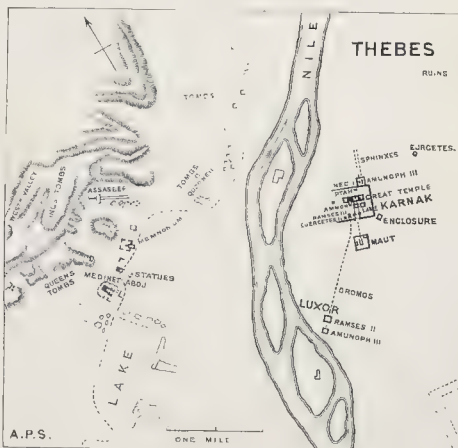
The *Dayr el Bahree*. An ancient temple, the plan of which is curious and differs entirely from that of any other temple; steps lead up from one court to another. Its founder was Amen-noo-het or Hatasoo, sister of Thothmes II and III. It is built of a beautiful marble-like limestone and not injured. Various chambers are covered by blocks projecting on each side until the two uppermost meet in the centre, the angles being rounded to form a vault. The first chamber is 12 ft. by 30 ft. Some blocks used to repair the upper court are "old materials". It was here that Maspero in 1881 discovered the royal mummies of XIX and XX dynasties (including the great Rameses II), brought from the original tomb in the "Valley of the tombs of the Kings" and deposited here; they have all lately been removed to the Boolak museum. MARIETTE, *Deir el Bahari*, *Doc. topog., etc., dans ce temple*, 4to. and pl. fol., Leipzig, 1877.

III. The *Tombs of the Kings*, called *Bab* or *Biban el Molook*, three miles from the river, containing the tombs of the XVIII, XIX, and XX dynasties and other personages. They are all excavated out of the rock, each consisting of a long inclined passage, with occasional chambers and halls. The entrance was built up. In the Eastern valley 25 such tombs are known; 47 have been mentioned by ancient historians. The oldest is that of Rameses I, and was opened by BELZONI. The best are as follows: No. 17, tomb of Sethi I (Belzoni's tomb); many of its chambers were sealed up; in one the fine alabaster sarcophagus now in Sir John Soane's museum, London, was found; SHARPE AND BONOMI, *Alab. Sarc. of Oimeneptah I*, 4to., 1864. This tomb is 470 ft. in horizontal length and 90 ft. in perpendicular depth; the paintings were all fresh and perfect when Belzoni found it. ACADEMY JOURNAL, vii. No. 11 tomb of Rameses III or Bruce's tomb; its granite sarcophagus was removed by Mr. Salt. No. 9 tomb of Rameses VI, called tomb of Memnon by the Romans who greatly admired it. The *Western Valley* contains the tombs of the last kings of the

ARCH. PUB. SOC.

XVIII dynasty. In the tomb of Amenhotep III, the line of direction varies in three places; a well prevents the ingress of rain-water and of the curious visitor. At *Drah Abool Negga*, near Koorneh, behind the temple, are tombs of XI dynasty (two "Entef" are at Paris); also of XVII and XVIII dynasties; and of the queen found 1859 by Maspero, with the magnificent jewellery now in the Boolak museum. Tombs of the Assaseef, of XIX, XXII, and XXVI dynasties; the tomb of Petamunoph is the largest of all, and of the tombs at Thebes, occupying nearly one acre; its date is doubtful, supposed XXVI dynasty.

The *Tombs of Sheykh Abd el Koorneh*, behind the Rameseum, are on the principle of those at BENIHASSAN; Nos. 16 and 35 are the most interesting; No. 16 dates from Thothmes III to Amenhotep III. No. 35 tomb of Rekhmara is by far the most curious of all, as exhibiting the manners and customs of Egypt. The tomb of Neferhotep, a royal scribe, has some very curious sculptures. Near it is Koornet Murrae, where is the tomb of Hooi, a functionary of XVIII dynasty. At the entrance of the valley are several tombs of the early date of Amenhotep I. Some of these have crude brick roofs, and a niche proves the existence of the arch. A crude brick pyramid is of an early epoch. *Tombs of the Queens*. All have suffered from the effects of fire; they have few attractions after the above. The *Gabbanel el Kerood*, or Apes' burial-ground. RHIND, *Thebes, its Tombs and their Tenants, ancient and modern*, 8vo., 1862: reviewed in BUILDER JOURNAL, 1862, xx, 382. GAILHABAUD, *Monuments*, 4to., Paris, 1842-52, i.



Works on the east bank of the river. IV. LUXOR (el Uksor or Abool Haggag: El Kosoor, or the palaces). The temple originally backed on the river, but a stone quay was built by the Ptolemies or Cæsars. The entrance is towards the dromos of sphinxes leading to Karnak. The great court, the pyramidal pylons, obelisks, and statues, were built by Rameses II, while the pylon and large colonnade, the chambers, and the sanctuary, were built by his predecessor Amenhotep III. It has been lately excavated by Maspero. Of the two obelisks of red granite one, 77 ft. high, was brought 1831-6 to Paris (OBELISK); the remaining one is 84 ft. high. Behind it are two sitting figures of Rameses II, one on each side the pylon or gateway; another one at the north-west end of the propylon. There are two courts, the first being 190 ft. by 170 ft. surrounded by a double row of columns; and the second 155 ft. by 167 ft. surrounded by a row of twelve columns in length and breadth, terminating in a covered portico of thirty-two columns, 57 ft. by 111 ft. The sanctuary behind these was rebuilt by Alexander, son of Alexander, the earlier one having probably been destroyed by the Persians. Behind this are sets of chambers, the walls of one

L

being covered with late Roman frescoes. This temple has been recently cleared of the Arab houses.

V. KARNAK or Carnac. From Luxor, a dromos extends for about a mile long, lined with sphinxes, some of which still exist, having the head of a woman (?) on a lion's body and between the forefeet a statue of Amenhotep III. Then it turns slightly to the left and continues as a dromos of sixty criosphinxes or ram-headed sphinxes, leading to the majestic pylon of Euergetes II. A short dromos of sphinxes leads on to the small temple of Rameses III, added to by Rameses XIII; this is dedicated to Khons (it was formerly known as the temple of the South, and is given in GAILHABAUD, *Monuments*, 4to., Paris, 1842-52, i; which also gives "a palace of Menephtah" having a row of pillars in front). To the left of it is a smaller temple of Euergetes II dedicated to Athor. These three face somewhat south-west, as Luxor faces north-east. The Great Temple faces a little north of west. It is about 370 ft. by about 1,200 ft. deep. The first court added by Shishak of XXII dynasty (990 B.C.), is 275 ft. by 329 ft.: the south side is broken by a small temple to Rameses III (1219 B.C.). A second propylon leads to the great hall 329 ft. long by 170 ft. deep; the lintel stones of its doorway were 40 ft. 10 ins. long; a central avenue of six columns on each side 62 ft. high without plinth and abacus, and 11 ft. 6 ins. diameter, has sixty-one smaller columns on each side of them. The hall built by Sethi I was originally lighted by a sort of clearstory, part still remaining. A third propylon leads to a narrow uncovered court (Thothmes I) in which stood (one fallen) two obelisks of red granite about 75 ft. high. Beyond is a hall of Osiride figures; two obelisks remain in it of red granite, the one still standing being 97 ft. 6 ins. high, bearing the name of Hatshepsu, the daughter of Thothmes I, who built this part. Beyond this succeed many courts, the sanctuary and its chambers, and a grand columnar edifice of Thothmes III.

To the south of the western end is a large tank lined with masonry over which the dead were carried; and connected with the above grand temple are various smaller ones, as that of Ptah against the northern wall of enclosure, on the other side of which is a temple to Amenhotep III, now in ruins; to the west is one to Nectanebo I.

From the south end of the open court between the Great Hall and the Hall of Osiride figures, and looking to the south, is a long avenue of colossal statues and four pylons. From the last pylon an avenue of sphinxes leads southwards to an enclosure having a lake of circular form, and the ruins of the smallish temple of Maut: it bears the names from Thothmes III to Tirhakah. In the two first courts and passages are numerous statues of Pasht, the lion-headed goddess, all of black granite and uniform in form and style, ranged close to each other along the wall, in one and two rows. There are two smaller temples within the enclosure. Mr. E. Falkener discovered three protodoric capitals at Thebes, given in his *Museum of Classical Antiquities*, 1851, copied by Beulé in *Revue Générale de l'Architecture*, as from Elephantina (BUILDER *Journal*, 1860, xviii, 94).

Description de l'Égypte, fol., 1809, vols. 2 and 3. NORDEN, *Travels in Egypt*, fol., 1757, ii, pl. 108. BRUCE, *Travels*, 1768-73, 8vo., 2nd edit., 1805. SONNINI, *Voyage dans la Haute et Basse Égypte*, 3 vols., 8vo., 1799. BELZONI, *Narrative of Discoveries*, 4to., 1821; and forty-four plates, fol., 1820; 1822. FORBIN, *Travels in Egypt*, 8vo., 1820, p. 59, 67, 80. IRBY AND MANGLES, *Travels*, 8vo., 1823, p. 137, 149. HUGHES, *Travels*, 8vo., 1830, i, 327. WILKINSON, *Top. Survey of Thebes, Tapé, Thaba, or Diospolis Magna, etc.*, six large maps each 34½ by 22½ ins., 1830. HOSKINS, *The Great Oasis, etc.*, 8vo., 1837; and his *Ethiopia*, 4to., 1835, p. 328. LEPSIUS, *Discoveries*, 8vo., 1853, p. 274, 280, etc. BONOMI AND SHARPE, *Egypt, Nubia, and Ethiopia*, 100 photos., 4to., 1863. FERGUSON, *History of Architecture*, 8vo., 1865-67. ZINCKE, *Egypt of the Pharaohs, etc.*, 8vo., 1871, p. 117, 127; 2nd edit. 1873. MARIETTE, *Karnak, Etude top. et archéologique*, 4to. and fol., plates, Leipzig, 1875. *Les listes*

Geog. des Pylônes — comprenant la Palestine, l'Éthiopie, le pays des Soud, 4to., and plates fol., Leipzig, 1875. A. B. EDWARDS, *Up the Nile*, 8vo., 1877, i, 200; ii, 600. WILKINSON, *The Ancient Egyptians, etc.*, 8vo., 1847; edit. by BIRCH, 3 vols., 8vo., 1878. POOLE, *Egypt*, 1881. PERROT AND CHAPIER, *Art in Ancient Egypt*, 2 vols., 8vo., 1882. BRINDLEY, *Ancient Quarries of Egypt*, in ROYAL INST. OF BRIT. ARCHITECTS, *Transactions*, 1888, iv, new series, p. 19. 2. 14. 23. 25. 28. 50.

THEKAL. One of the early forms in Greece of a sepulchral mound of earth or stones. 78

THEKYNG. Covering with a roof, or thatching. "1429 the thekyng of the steppill of my parish kyrke 26s. 8d"; SURTEES SOCIETY, *York Fabric Roll*, 8vo., 1859, p. 16, 264; 357.

THEMIS. The Greek goddess of law and order; who seems to have had several altars, sanctuaries, and shrines, as in Greece at Thebes, Olympia, Athens, Tanagra, and Troezen, but probably no very important temple. At RHAMNUS is a small one "in antis" of the Doric order; 31 ft. by 20 ft. 11 ins., and is without an opisthodomos: the height is the same. It was probably damaged by the Romans. SOCIETY OF DILETTANTI, *Unedited Antiquities of Attica*, fol., London, 1817, chap. 6-8; HITTORFF, French edition, 1832. A temple to Themis (as supposed) at Eleusis, faced almost, if not exactly, eastward. A Themisionium at Kai-issar or Karahissar; ARUNDEL, *Asia Minor*, 8vo., London, 1834, ii, chap. 5. 1. 14.

THENARD'S BLUE. A sort of cobalt blue; a salt of calcium calcined with alumina or oxide of tin; it is purest when free from iron; it is also called Vienna blue.

THENE (HANS or JOHANN); see ARMNECHT (P.).

THENGAN or Tengaun; see HOPEA.

THEOCIDES; see TEOCIDES.

THEODORIC; TOMB OF. See RAVENNA.

THEODORICUS, from Gelderland, rebuilt 1432-40 S. Martin's church at Tiel; the foundation of the tower was laid in 1431, and he had raised it to the roof of the church when he died 1440; he was succeeded by P. Nicolaasz. *Chronicon Tielense*. 24.

THEODORICUS, 13th Cistercian abbot of the abbey of Notre Dame des Dunes, in Flanders, finished the church of his order in 1262, begun 1214. SANDERUS, *Flandria illustrata*, fol., Colon. Agrip., 1641-44, i, 249.

THEODORUS of Samos, assisted his father Rheekos and his brother Telekles about B.C. 580, in the labyrinth at Lemnos; PAUSANIAS, iii, 12, 8. PLINY, *Nat. Hist.*, xxxiv, 8, 19; who also xxxvi, 13, 19, writes "Architecti illum fecere Smilis et Rheekos et Theodorus". At Sparta was a circular edifice which according to PAUSANIAS was said to have been erected by Theodorus, and was reputed to be the oldest known odeion; it was called "skias" (NEWTON, *Lecture*, 9 May 1888). Theodorus advised the laying of a layer of charcoal covered with fleeces in the foundations of the third temple of Artemis (Diana) at Ephesus, begun by him about B.C. 600: and wrote a treatise on the Doric temple to Rhea, Hera, or Juno at Samos, B.C. 640-600; VITRUVIUS, pref., vii, 2. This Theodorus is considered to be of a later age than the first Theodorus, for there was perhaps a Theodorus son of Telekles. WOOD discovered the remains of three distinct temples at Ephesus, the last but two, the last but one, and the last. The former was probably built 500 B.C., for which the foundation described by PLINY, VITRUVIUS, and DIOGENES LAERTIUS, ii, seg. 103, was laid. He found that under the walls of the cella a layer of charcoal 4 ins. thick was placed between two layers of a composition about 3 ins. thick, similar to, and of the consistency of glazier's putty; FERGUSON, *Temple of Diana*, in R.I.B.A., *Sessional Papers*, January 1877, p. 80. NEWTON, *Essays*, 1880, p. 75, 216. BLOUET, *Morée*, fol., Paris, 1834-36, p. vii. A Theodorus of Samos has the credit of inventing keys to doors; PLINY, vii, c. 56. SILLIG, *Cat. of Artists*, translated by Williams, 8vo., London, 1836. 1. 3. 5. 59.

THEODORUS Silentiarius. Architect to the emperor Justinian (526-64), for whom he designed the Episcopia fort, near

Athira, in Thrace; according to PROCOPIUS, transl. by STEWART, 8vo., London, 1886, p. 116. He also built 532 the church of S. Mary, at Jerusalem, for the same emperor (p. 138). REP MARBLE.

THEODORUS of Phocis, wrote about the *tholos* or vaulted temple at Delphi, in Phocis. VITRUVIUS, pref., vii. 3. 7.

THEODULPHUS of Orleans; see ORLEANS (abbot T. of).

THEOLOGEION. The place from which deities descended in a theatre of the Greeks.

THEOREM. That which is considered and established as a principle. *Propositions, maxims, and theorems* by WARING, in *BUILDER Journal*, 1849, vii, 590; and 1850, viii, 518. MAXIM. PRINCIPLE.

THEORY. The study of the abstract principles of a science or art, exclusive of the practice of it. MOOS writes, "The student, when he has finished his course, will not fail to see and be surprised at the very narrow limits within which alone, as practice has shown, the result of his theory may be relied upon. He will discover, that in examining its theoretical side, he has learnt but little of the art of designing, and that he has as yet a great deal to learn in that art from practice and experience." UNWIN, *Use of Theory*, pamph., 8vo., 1888. 14. 25.

THEOSTASIS. A chapel in the temple of Minerva at Cadiz as named in a Roman inscription dedicated by P. Rutilius Sintrophus, "marmoribus"; LLAGUNO, i, 237. 66.

THEOTHECA (Lat. *ciborium*). The monstrance or remonstrance, the SACRAMENT HOUSE, or pix, of the Roman Catholic church. The receptacle for the consecrated host. TABERNACLE (Fr. and Span. *custodia*).

THEOTOCOPULI (DOMENICO); see TEOTOCOPULI (D.).

THERA. The modern SANTORIN, in the Cyclades.

THERASKIA, near SANTORIN; a prehistoric Pompeii.

THERICO, the modern name of THORICUS.

THERIOTROPHIUM. The name *Leporaria*, small walled paddocks, planted for shelter for hares, etc., was in process of time changed for the term theriotropheium, as including wild animals, as boars, stags, and deer for the hunter, in Italy and its provinces. SMITH, s. v. *Agricultura*, p. 696. 78.

THERMA. The modern THESSALONICA, in Turkey in Europe.

THERMÆ. The ancient baths of the Greeks and Romans. There is scanty material for an architectural description of the thermæ of the early Greek period, but there are minute and circumstantial descriptions of those of the later or Roman period, beginning with that of VITRUVIUS, lib. v, cap. 10 and 11, and proceeding with those of SENECA, *Ep.* 86, and PLINY, *Let.* ii, 17; v, 6, to the time of LUCIAN, describing some baths just erected by Hippias, a range probably of 150 years. Properly speaking, the Roman thermæ were an adaptation of the Greek gymnasium, or palestra. Marcus Agrippa was the first who afforded these luxuries to his countrymen, by bequeathing to them the thermæ and gardens which he had erected in the Campus Martius at Rome. The rotunda, now Pantheon, was formerly considered to have been a vestibule to these baths. These, with the baths of Nero are supposed to have been perfect in 466. Those of Titus are of vast extent, now partly underground and partly above the Esquiline Hill. Trajan, Caracalla, and Diocletian followed, and of the two last ample remains still exist; and even to as late as Constantine, besides several erected by private individuals. PUBLIUS VICTOR, *Descr. Urbis Romæ*, fol., 1552, enumerates 16, and PANVINUS, *Descr. Urb. Romæ*, fol., 1597, p. 106, has added four more; the former states there were 850 baths, public and private, in Rome.

Approximate dates A.D. of thermæ, from QUATREMÈRE DE QUINCY, *Dict. d'Arch.*, 1832:—

*Agrippa 10	Trajan 110	Philip 245
*Nero 64	Hadrian 120	Decius 260
Vespasian 68	Commodus 188	Aurelius 272
*Titus 75	*Anton. Carac. 217	*Diocletian 295
*Domitian 90	Alex. Severus 230	*Constantine 324

Those marked * are given in the work by CAMERON, who also illustrates the bath near Bologna, the thermæ at Paris, caldarium at Pisa, those of Hippias from Lucian's description, figures from MONTAUCON, *Antiquities*, iii, the church of Sta. Maria Maddalena near Nocera, a round bath, with a Roman castellum and its aqueduct supply. There were the great thermæ in North Africa, at Kalama, now Guelma; at Bath in England; at Antiphellus; at Trèves; and several others may be gathered from the list of publications. *Detached Essay*, Baths and Wash-houses (plate 1, fig. 1), being the ground plan of the splendid baths of Diocletian, which comprehended palestæ, hexedra, a stadium, libraries, and even a theatre.

ALVEUS, APODYTERIUM, ASSERCELLA, BALNEUM, BAPTISTERIUM, CALDARIUM, CONCAMERATA SUDATIO, CONISTERIUM, ELEOTHESIUM, EPHLEBEUM, EXEDRA, FRIGIDARIUM, GRADUS, HYPETHRUM, HYPOCAUST, LABRUM, LACONICUM, LATRINA, NATATIO, NATATORIUM, PISCINA, PLUTEUS, PRÆFURNIUM, PROPNIQIUM, PULVINUS, PUTEUS, SCHOLA, SPHERISTERIUM, SPOLIATORIUM, SUDARIUM, TEPIDIARIUM, UNCTUARIUM.

SERLIO, *Architettura*, fol., Venice, 1540; Vicenza, 1584; Venice, 1663, gives 160-3, the Thermæ Antoninæ († Caracalla); 168-170, Diocletian; 164, Titus. BLONDEL, *Thermarum Aquisgranum*, 4to., 1688. LORD BURLINGTON AND CAMERON, *The Baths of the Romans*; 1730, 1772, 1775; and by O. B. SCAMOZZI, fol., 1785. COCCHI, *Dei bagni di Pisa*, 4to., 1750. PIRANESI, *L'Antichità Romane*, 1756. PONCE, *Collection des Peintures trouvées dans les Bains de Titus*, 60 plates, fol., Paris, 1759; 1786. ZACCARIA, *Antichissima Badia di Leno*, 4to., 1767. MIRRI and CARLETTI, *Le Antiche Camere delle Terme di Tito*, fol., Rome, 1772; 1776; 1784. CARLONI, *Antiche pitture dei Bagni di Costantino*, fol., Rome, 1780. *Collection de Peinture antique de Palais*, etc., 53 pl., fol., Rome, 1781. CASSINI and AMADUZZI, *Pittura Antiche*, fol., 1783. POWNALL, *Notices*, etc., of Prov. Romana of Gaul, now Provence, Languedoc, and Dauphiné; with App. of Roman baths and Thermæ discovered in 1784 at Badenweiler, 4to., London, 1788. PONCE, *Arabesques Antiques des Bains de Livie, et de la Ville Adrienne avec les plafonds della Villa Madama*, fol., Paris, 1789; 1805. FUMAGALLI, *Ant. Longobardiche Milanese*, 4to., Milan, 1790, i, 152, gives a plan of the baths of Maximian by L. Cagnola who had been employed to preserve from further ruin its sixteen Corinthian columns. STIEGLITZ, *Archæologie der Baukunst*, 8vo., Weimar, 1801, ii, 267, etc. GELL, *Pompeiana*, 8vo., 1817-19. WINCKELMANN, *Monumenti antichi inediti*, 2 vols., fol., Naples, 1820. HIRT, *Lehre der Gebäude*, fol., Berlin, 1821-27, 3 vol., p. 233, etc. WEINBRENNER, *Entwürfe — antiker Gebäude*, Carlsruhe, 1822, pt. 1. ROMANIS, *Le Antiche Camere Esquiline dette Terme di Tito*, fol., Rome, 1822. BECCHI, *Museo Borbonico*, fol., 1824, ii, p. 49-52. COCKBURN AND DONALDSON, *Pompeii*, fol., 1827. BLOUET, *Rest. des Thermes de Caracalla à Rome*, fol., 1828. LIB. OF ENTERT. KNOWLEDGE, *Pompeii*, 8vo., 1832, i, 150; 172, 187. BECKER, *Gallus*, 8vo., Leipzig, 1838, ii, 11; and Charikles, 8vo., Leipzig, 1840, ii, 135-146, 459-62. SOMMERARD, *Les Arts du Moyen Age*, fol., 1838-46, the thermæ of Julian at Paris, *Album*, i, 69-74; ii, 158; also *Souvenirs de Vieux Paris*, fol., 1836, 12 edit. CANINA, *Architettura Antica*, fol. and 8vo., Rome, 1839-46. POPPIANI, *Fabbriche di Palladio*; *Terme*, etc., fol., 1842-44. BRULOFF, *Baths of Pompeii*. BURGESS, *Thermæ of Ancient Rome*, read at ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, May 1842, printed in CIVIL ENGINEER, ETC., *Journal*, v, 221-4. GIBBON, *Decline and Fall*, 8vo., edit. 1854, i, 477; iii, 563, 573. VIOLET-LE-DUC, *Entretiens*, 8vo. and 4to., Paris, 1860, i, 131-33. *A Walk and Talk in the Baths at Rome*, *BUILDER Journal*, 1862, xx, 921. GEYMULLER, *Documents Inédits sur les Thermes d'Agrippa, le Panthéon et de Dioclétien*, 4to., Lausanne, 1883. NISPI-LANDI, *M. A., e i suoi tempi: le terme ed il Pantheon*, 2nd edit., fol., Rome, 1888. AITCHISON, *Lectures on Roman Thermæ*, *BUILDER Journal*, 1889, lvi, 103, 121, 142.

Roman baths in England, have been found 1739 at Lincoln; Chester (ROYAL DUBLIN SOCIETY, 8 Jan. 1859); Boughton Mon-

chelsea, Kent (ARCHÆOLOGIA, xxix); Carisbrooke; 1859 Uriconium near Shrewsbury; Bath (DAVIS, *Guide to Roman Baths at Bath*, 8vo., Bath, 1883); 1700 Wroxeter; and traces at other places. HAUGHTON, *Roman Baths in England*, read at Arch. and Arch. Society of Liverpool, 8vo., London, 1861; and printed in *BUILDING NEWS Journal*, vii, 1861, p. 368-9. 1. 14. 25. 78.

THERMES; see TERM or TERMINAL.

THERMOPLASTIC PUTTY; see PUTTY.

THERMOPOLIUM. A wine-shop, of which an example was found at Pompeii; LIB. OF ENTERTAINING KNOWLEDGE, ii, 192-3, near the house of the questor.

THEROULDE (THOMAS), was employed on the church at Caudebec; and from 1501-6 on the church of S. Ouen at Pont Audemer, with the fortifications and fountains of the town; LANCE, *Dict. des Arch. Franç.*, 8vo., 1872.

THESAURUS. The TREASURE-HOUSE of the Greeks, as of Atræus at MYKENÆ; and of Minyas at Orchomenos; also to places under the temples; WALPOLE, *Memoirs*, 4to., London, 1817, p. 553. The public treasure-house of the Romans, was the ERARIUM. It was also in the opisthodomus of the temples. One of the many names given to the PROTHESIS or secretarium, placed on the right of the bema of the ancient basilican church.

THESEIUM, or Temple to Theseus, the national hero of the Athenians. It is the best preserved of all the monuments of ancient Athens. It is a hexastyle and peripteral temple and a tomb, erected B.C. 469-465 and therefore about thirty years older than the Parthenon, with a sacred enclosure around the temple large enough to serve as a place of military assembly. The temple is 104.23 by 45.011 ft. on the upper step (PENROSE). It was restored and is used as the national museum of Greece. ATHENS. TELAMONES. SMITH, *Dict. of Geog.*, i, 287-9. BRETON, *Athènes*, 8vo., Paris, 1868, p. 187-204. 1. 23.

THESILIUM. The building at Megalopolis, in which the deputies of the different cities of Arcadia used to assemble to deliberate on their affairs. It was so named from its founder. 2.

THESSALONICA (Anc. Therma; Turk. *Saloniki*; Fr. *Salonique*. The *Salonika* of the English). A large seaport city of Turkey in Europe. It was pillaged in 904, 1185, and 1430. The remains of lofty walls, cyclopæan in the lower part and brick above, are five miles in extent; those on the seaside were removed after 1869 to form a quay 2,000 yards long, and to enlarge the city. They are surmounted by a fortress with seven towers. A curious building with sculptures is given by STUART, *Athens*, who mentions the propyleum, called "Incantada", having a magnificent marble Corinthian colonnade of five columns, an attic and figures in alto relievo, all were removed under the second empire, to the Louvre: also two triumphal arches (one to Marcus Aurelius), one on west side or Vardar gate, pulled down lately (1869), its inscription is in the British Museum; the east arch, supposed to be dedicated to Constantine, is about 100 yards inside (PEDESTAL). Out of about thirty-seven Christian churches, now mosques, the following are noticed:—the mosque of Sta. Sophia, similar to that at Constantinople, but on a smaller scale, bema and columns of verde antico; PULLAN AND TEXIER, *Byzantine Architecture*, fol., 1864, p. 111, gives a good description of it. S. George, circular with a closed cupola, was converted into a church *cir.* 400. S. Demetrius, five-ailed, built 500-520, or 597; burnt 690, and rebuilt, has a gallery over the aisle. Eske djuma was a temple to Thermean Venus, which could be easily restored nearly equal to the Theseium at Athens. STUART AND REVETT, *Antiq. of Athens*, fol., 1816, iii, pl. 46-8; and HITTORFF, French edition, 1832. DEVEREUX, *Views on Shores of the Mediterranean*, fol., 24 pl., 1847. M. A. WALKER, *Through Macedonia*, 8vo., 1864. 2. 25. 28. 50.

THESSALONICA (SIMEON of). The "Durandus" of the Eastern Church; ECCLESIOLOGIST *Journal*, 1845, iv, 105.

THETFORD (ARFAST or HERFAST of), was 1070 constituted bishop; 1075 removed the see from Elmham to Thetford, where was a strong and spacious castle, owned by Roger Bigod, who assisted Arfast to build his cathedral with a mansion to the

north of it. Dying in 1084 he was buried in the church; BRITTON, *Norwich*, 4to., 1816, p. 13-4.

THETFORD (WILLIAM HERBERT of); also called Galsagus or Galfagus and de Losing or Losinga; see HERBERT (W.).

THEURING (NICHOLAUS), of Innsbruck, commenced 1553 the Franciscan church of the Holy Cross, which was finished 1558-64 by M. della Bolla. 26. 68.

THEVESDALE or Thefdale quarry, near TADCASTLE.

THEVESTE or Thevesa; now TEBESSA, in Algeria.

THIAC (JEAN BAPTISTE), a pupil of Louis, practised at Bordeaux at the end of the last century. His son JOSEPH ADOLPHE was born in December 1800, studied under Lebas; 1824 went to Rome; returned 1828; and was appointed 1830 architect to the department of La Gironde. He designed 1839 the palais de Justice and the prisons; completed the building of the gendarmerie begun by Poitevin; rebuilt the hôtel des postes, and restored that of the préfecture; the bazar bordelais; the maisons Bosc and Espeleta; his own residence; and the church and convent des Carmes in the environs, the château de la Grange, the château de Giscours, and that of Puyveau. He began 1861 the college of the Sourdes Muettes, but died in 1866 before its completion. LANCE, *Dict. des Arch. Franç.*, 8vo., 1872.

THIBAULT. A priest and chanter of the church of S. Geneviève at Paris, is said to have constructed part of the clock tower, about 980. MIGNARD. 56.

THIBAUT and THIBAULT (JEAN THOMAS), also a painter, born Nov. 20, 1757, at Montierender, Haute Marne; was a pupil of E. L. Boulée and of R. A. Paris; and studied under J. L. d'André of L'île Adam, where he became acquainted with P. F. L. Fontaine (*Biog. Univ.*, 8vo., Paris, 1856, xiv, 316). Having gained the "grand prix", he resided in Rome for some years. Returning to Paris he 1793-95, in partnership with J. N. L. Durand, submitted eleven designs in the government competition for public monuments, and obtained four prizes; the designs are given in VAUDOYER, *Projets*, fol., Paris, 1806. He embellished the palaces Neuilly, Malmaison, Bourbon Elysée, and others; and being invited to Holland, renovated the town-hall at Amsterdam, adapting the interior for the residence of king Louis Napoleon; repaired the palace at La Hague; and other edifices. On his return in 1818 he was elected a member of the académie des beaux-arts. His *Application de la Perspective linéaire aux arts du dessin*, was edited by his pupil Chapuis, fol., Paris, 1827; also 1831; and by Reindel, Nuremberg, 1833-4. Alavoine was another pupil. His portrait is in the museum at Lille. He died June 26, 1826, at Paris. MONITEUR, 1 July 1826. VAUDOYER, *Eloge*. DETOURNELLE, *Architecture Nouvelle*, 4to., Paris, an. xiii (1805). KRAFFT, *Charpenterie*, fol., Paris, 1805, pt. 2, p. 5, pl. 10. KRAFFT, *Plus Beaux Jardins*, fol., Paris, 1809-10, ii, pl. 11-13. 68. 110. 112. 113.

THIBET; see TIBETAN ARCHITECTURE.

THIERRI (JAN); see STEENHOUKEBELDE (J. T. VAN).

THIERRI (JEAN). In 1372 he with Michelin di Joncheri and Michelin Hardiot, masons, worked on the cathedral at Troyes; he went to Tonnerre to select the stone; and 1380 he was maître de l'œuvre. The two first designed and commenced the jubé, which was stopped 1382 by Henri de Bruxelles. QUICHERAT, *Notice sur registres—de Troyes*, in Mémoires de la Société des Antiquaires de France, x, 53. CALLIAT ET LANCE, *Encyc. d'Arch.*, 4to., Paris, 1858, viii, 109. LANCE, *Dict. des Arch. Franç.*, 8vo., 1872.

THIERRY (JACQUES ETIENNE), born 1750 at Paris, studied under Blondel and Radel. Between 1806 and 1817 he submitted several *projets* to the government for the embellishment of Paris; designed many mansions in and near Paris; repaired the château d'Arcy at Bagneux; and for nearly fifty years held a drawing school of much celebrity. C. P. J. Normand was one of his many pupils. He died 1832. 68. 110.

THIESS (CASPAR), in the service of the elector Joachim II of Brandenburg, built the electoral palace (altered by Schluter) at Berlin; and 1540 the hunting palace at Grunewalde, where

over the entrance he placed statues of the elector and himself. He died at Berlin, and was buried in S. Nicholas church, with a monument. He was one of the best masters of the time. 68.

THIETLAND; see TIETLANDUS.

THIODA; see TIODA.

THIRD POINT; see TIERCE POINT. 4.

THIRD POINTED STYLE of English mediæval architecture, or PERPENDICULAR PERIOD.

THIRSK (...) or Thurske, master mason at Westminster abbey, at work 1460 on the chantry chapel of king Henry V (died 1422), when he marked out the site which king Henry VI (died 1471) selected for his burial on the north side of the shrine of king Edward the Confessor. STANLEY, *Memorials*, 3rd edit., Svo., 1869, p. 161, 607.

THIRTEENTH CENTURY ARCHITECTURE. See EARLY ENGLISH, GOTHIC, or POINTED ARCHITECTURE; also SCHAFÉ, *XIII, XIV, and part of XV cent. Decorative Painting*, at Architectural Museum, 1856, *BUILDER Journal*, xiv, 293. SCOTT, *Lecture* at Royal Academy, in *BUILDING News Journal*, 1859, v, 86, 91; and *BUILDER Journal*, 1859, xvii, 76, 88, 138. SCOTT, *Lectures on the Rise and Development of Mediæval Architecture*, Svo., 1879, i, *passim*. STREET, in "Afternoon Lectures", 4th series, Svo., 1863. STREET, at "S. Paul's Ecclesiological Society", in *BUILDING News Journal*, 1879, xxxvi, 581, 596-8. STREET, *Lecture* at Royal Academy, in *BUILDER Journal*, 1881, xl, 296. The church of S. Denis, Sleaford, 1271, is a large and fine example; ASSOCIATED SOCIETIES, *Reports and Papers*, 1881, p. vii; also Warming-ton church, Northamptonshire, a unique XIII cent. parish church; some carvings are equal to those of same date in Westminster abbey; *idem*, 1876, p. lxxxiii; it was restored by Ferrey and Scott; and was illustrated by CAVELER, *Arch. Illustrations*, etc., 18 pl., fol., 1850. STREET, *Stone Church, Kent*, Svo., 1861, is another fine example, and is of the same date as the greater part of Westminster Abbey 1245-69, and supposed executed by the same workmen.

THIS (Gr.); also ABYDOS in Egypt. Besides the description contained s. v., and OSIRIS, later particulars are given in WILKINSON, *Modern Egypt and Thebes*, Svo., 1843, ii, 112. EDWARDS, *Up the Nile*, Svo., 1877, ii, 687. MARIETTE, *Cat. général des Mons. d'Abydos*, fol., 596 photos., Paris, 1880. MARIETTE, *Monuments of Upper Egypt*, Svo., London, 1877, p. 118. MARIETTE, *Abydos, descr. des fouilles, Temple de Seti*, fol., 53 pl., 1869, i. TENI.

THISTLE. The "Order of the Thistle" or "of S. Andrew" is now considered to have originated in the reign of James VII of Scotland and II of England; NICOLAS, *Orders of Knighthood*, 1840, iii. In botany (Fr. *chardon*, or *cher don*); there are many different species which have been dignified with the name of "Scotch thistle", as *CARDUS lanceolatus*, *Silybum Marianum*, *Onopordum Acanthium*, *Carduus acanthoides*, or the low growing species *Cnivus acaule*. The sculptured representations on the oldest parts of Stirling castle, Linlithgow palace, or Holyrood palace, especially one on the top of the garden doorway opposite the new fountain, is more like the head of *Cynara Scolymus*, the globe artichoke, than any thistle; *BUILDER Journal*, 1861, xix, 831. The metal-work termination of turrets in the Scotch castellated edifices often takes the form of the family crest, as in one instance, a star surmounted by the national emblem, the thistle. Also shown on a very singular pinnacled sun-dial at Kilburn on the Clyde. The Scotch architects availed themselves freely and successfully of the thistle, in their ornamentation.

Charles, cardinal de Bourbon and archbishop of Rouen (died 1488) erected a beautiful chapel in Notre Dame de Dijon; his brother Pierre de Bourbon (died 1503) completed it, married the daughter of Louis XI and multiplied the thistle among his decorations to signify that the king had made him a *cher don*; WOODS, *Letters*, 4to., 1828, i, 129. The thistle occurs in France and Belgium, especially in the Flamboyant style, and at Rouen are some magnificent examples. HIPKNOB, *Illustrations*, pl. xc, 1851-52, from DELAQUÉRIÈRE, *Essai sur les girouettes, épis, etc.*, Svo., Paris, 1846. DALY, *Revue Générale*, 4to., Paris, 1855, xiii, pl. 2.

ARCH. PUB. SOC.

It is shown in the pulpit xv cent. at Freyburg, in Saxony, MOYEN AGE PITTORESQUE, pl. 106-7-8. At Chartres, S. Ouen, etc., in ROMAGNESI, *Recueil d'Ornements*, 1834-36. In miniatures, in LANGLOIS, du pont de l'Arche, *Calligraphie au Moyen Age*, Svo., Rouen, 1841, pl. xvi, p. 150, No. 1.

THODESCA; see TEDESCA.

THOLOBATE. The term applied by HOSKING, *Architecture*, in ENCYCL. BRITANNICA, 8th edit., to that part of a building on which a dome is placed. 19.

THOLOS (Gr.). A circular edifice, a rotunda, having a dome; a conical chamber. That of *Epidaurus* (by Polycleitus, about B.C. 320?) must have been a superb edifice, but it requires great examination on the spot to understand it fully; PENROSE, in ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Proceedings*, Oct. 1887. At *Olympia*, the tholos or Philippeium, was built by the father of Alexander the great, or by his directions. He died B.C. 336. It was about 49 ft. 6 ins. diameter measured on the bottom step, having a peristyle of eighteen Ionic columns, round a cella 24 ft. 8 ins. diam. in the clear; described by LEWIS, *Notes during Tours in Greece*, in *idem*, *Transactions*, 1887, p. 90, 97-101. At *Athens*, was a circular edifice covered with a stone dome; it contained some small silver images of the gods, and was the place where the Prytanes took their common meals and offered their sacrifices. The dome may have originated from the treasury of Minyas at Mycenæ; the tholos to the palace at Ithaca; the tholos at Athens where the prytanes sacrificed; that built by Theodorus of Samos, near the agora at Sparta; that at Epidaurus by Polycleitus; that at Delphi by Theodorus of Phocæa, who wrote on the work; INWOOD, *Ærechtheion*, fol., 1827, p. 69. 2. 6. 25. 78.

THOMAN (JÉRÔME), was a pupil of Elias Holl of Augsburg, and about 1629 designed the four angles of the hôtel de ville of that city. D'ARGENVILLE, *Vies des Arch.*, Svo., Paris, 1788, i, 297. H. Thomann von Hagelstein, who died 1650, is supposed to be the same person. 68.

THOMAS; SAINT. He was a fisherman, but is represented as carrying in one hand a stone, and in the right hand a rule or square, with its angle near his right shoulder. He was chosen as the patron of architects and builders. LEGENDA AUREA. BULTEAD, *Descr. de la Cath. de Chartres*, Svo., Chartres, 1850. VINCENT DE BEAUVAIS, *Miroir Historical*, ix, c. 62-66. MARTIN ET CAHIER, *Monographie de Bourges*, fol., Paris, 1841, cap. 11.

THOMAS (maître), of Portugal, is mentioned in a document of 1512 as employed at the Batalha. Probably the "Thome velho" who did the tomb of D. Theatino in one of the cloisters of S. Croix at Coimbra; DENIS, in *Univers*, 1366, liv, p. 392; and is probably the same as Thomas Fernandez, who was sent to the Indies as maître des travaux, by king Emmanuel, and erected the fortresses until 1506; DAMIEN DE GOES, *Chron. du roi Emmanuel*, part 2, ch. 16; CASTANHEDA, *Patriarchie*, Liste des artistes, p. 6, praises him highly. RACZYNSKI, *Lettres—Arts en Portugal*, Svo., 1846, p. 228.

THOMAS; master mason; see CANTERBURY (T. OF).

THOMAS DE CORMONT; see CORMONT (T. DE).

THOMAS (GAÉTAN), of Lisbon, designed 1743 the palace and the Church das Necessidades. E. G. de Sousa was a pupil. RACZYNSKI, *Dict., etc., de Portugal*, Svo., Paris, 1847, p. 106. 68.

THOMAS (JOHN), also a sculptor, born 1813 at Chalford, in Gloucestershire, was apprenticed 1825 with a mason near; he assisted his brother William, an architect at Birmingham. A monument by him at Huntingdon, attracted the attention of sir C. Barry, who employed him on the schools at Birmingham. He soon after accompanied his brother to Leamington, assisting him in his designs; but returning, was employed by E. Blore at Crewe, and elsewhere; and then by sir C. Barry and Aug. Welby Pugin at the new palace at Westminster for seventeen years on the carving and sculpture. The huge Egyptian lions at the Britannia tubular bridge, each 25 ft. long, are his work. He designed Somerleyton hall, for sir S. M. Peto (view in *BUILDER Journal*, 1851, ix, 362); Preston hall, Aylesford, for E. L.

Betts; railway station at Lowestoft, and the Royal hotel, fish-market, toll-houses, reading-room, and the chief engineer's house: also the church (except the tower) at Somerleyton, cottages in blocks on the green; a chapel, and the well; similar cottages at Aylesford; mansion at Lee, Kent, for John Penn: 1855 converted the Diorama, Regent's park, into a Baptist chapel (*idem*, xiii, 210; pulpit 247): 1855 visited Constantinople to decorate the palace of the sultan on the Bosphorus; and executed for him eight vases on pedestals, each 10 ft. high, of various marbles. He competed for the Wellington monument for St. Paul's cathedral (*idem*, 1857, xv, 539); and designed the waterworks at the head of the Serpentine in Hyde park. He also designed and executed the mausoleum of sir W. Molesworth, in Cornish granite; the memorial drinking-fountain at Maidstone, Kent; and to sir Hugh Myddelton on Islington green (*idem*, 1862, xx, 261). He died 9 April 1862, of overwork, aged 49, at Blomfield road, Maida Hill. A long list of his works in sculpture are named in HEFFER, *Account of the Life, etc.*, in LIVERPOOL ARCH. AND ARCH. SOCIETY, *Transactions*, 8vo, Liv., 1862, p. 111-20. *BUILDER Journal*, 1862, xx, 275.

THOMAS (MATTHEW EVAN), gained 1815 the gold medal in architecture at the royal academy for a design for a palace; went 1816 to Italy; was elected a member of the academies at Rome and Florence; exhibited at the academy 1820-22; died 1830, and was buried at St. John's Wood chapel.

THOMAS (WILLIAM), "M.S.A."; exhibited 1780-94 at the Royal Academy of Arts, published *Original executed designs in Architecture*, 27 pl., fol., 1783, which contains, besides designs unnamed, a Gothic temple for earl of Shelborne; west wing and offices at Stackpole court, for John Campbell, esq.; Surrey chapel, Blackfriars road, of sixteen sides, 80 ft. diam., for Rowland Hill; and house for Mr. John Mirehouse, in Pembroke-shire. In 1786-88 he designed Willersley castle, Derbyshire, for Richard Arkwright, esq.; it was burnt 8 August 1791 and again completed; NEALE, *Seats, etc.*, 4to., i, 1818. He was a member of the Artists' club. The date of his death is unknown.

THOMON (THOMAS DE), Thomond, Tomon, and Tonon, properly DUMOT, was born 1756 at Paris, or 1759 at Nancy. At the revolution he emigrated to Russia and became a major in the army. Having been educated as an architect he was appointed architect to the emperor Alexander I. He improved and in part reconstructed 1802-4 the great or *Volskoi* theatre; 1804-11 continued the *borgha* or exchange (commenced 1784 by Quarenghi), the hall opened 1816; the magazines des suifs; all at St. Petersburg; 1805 the mausoleum of the emperor Paul, at Paulovski; 1809 the column to Peter the great at Pultava; the theatre at Odessa; and other works. He published *Plans et Façades des principaux Monuments construits à S. Petersb.*, 1806-8; and *Traité de Peinture*, 8vo., St. Pet., 1809. He died August 23, 1813 (or 1816) in Russia. A list of his paintings is given in DUSSEIX, *Artistes Français à l'étranger*, 8vo., 1856, p. 419-20. SVININ, *St. Petersb.*, 4to., S. P., 1816-28. GRANVILLE, *St. Petersb.*, 8vo., 1835, ii, 297. 68.

THOMPSON (BENJAMIN), count Rumford, was born 1752 at Woburn, New England. In 1784 he was in England and was knighted. Subsequently he entered the service of the king of Bavaria and there prosecuted his most useful labours on behalf of the poor, the army, etc., for which he was knighted and created a count. He returned to England, assisted in founding the royal institution, and designing the lecture-room, the sketches for which, presumed by him, are at the Royal Institute of British Architects. In 1802 he resided at Paris; retired to Auteuil, near that city, and died ... August 1814. *Essays, political, economical, and philosophical*, 4to. edit., 3 vols., 8vo., London, 1798-1802. *Complete Work of Count R.*, 8vo., Boston, U.S.A., 1870, etc. DANFORTH, *Theory of C. and fireplaces*, 8vo., 1796. BRAIDWOOD AND SON, *R.'s chimney fireplaces improved*, 8vo. (1797?). *Essay on chimney fireplaces*, 8vo., Glouc., 1862. EDWARDS, *Smokeless Grates*, 8vo., 1869. *Detached Essay*, Heat.

W. M. WILLIAMS, *On Rumford's Scientific Discoveries*, read at Royal Institution, March 1871. 14.

THOMPSON (GEORGE), in 1634 rebuilt the crown of the tower of the chapel of King's college, Aberdeen; he was master-mason, and "architect" is inscribed on it. ARCHITECTURAL INSTITUTE OF SCOTLAND, *Transactions*, i, 55-67.

THOMSON (ALEXANDER), called "Greek Thomson" from the bent of his studies, born 1817 at Balforn, Stirlingshire, went to Glasgow about 1824, and was apprenticed to Robert Foote, who having had the benefit of foreign travel had realised the beauties of Greek architecture, which influenced the career of his pupil. In 1849 Thomson joined his brother-in-law J. Baird. During their partnership they jointly carried out many works in Glasgow and the surrounding country, as Knockderry and Craigrownie castles; the Italian villa; several marine residences on the shores of Loch Long, Langband, and Innelhan on the Firth of Clyde; Rosneath and Garelochside; the Caledonia road United Presbyterian church, in Glasgow, and others. In 1856 he entered into partnership with his brother George, and designed St. Vincent, U. P. church. After he left for the west coast of Africa, Thomson formed a connection with Mr. Turnbull, and designed, among other works,—Queen's Park U. P. church; Egyptian hall, Union street; range of buildings in Gordon street facing Alston street; a house in Bath street next the Mechanics' Institute; two imposing edifices on the north side of Sauchiehall street, one being now the Washington hotel; and Holmwood villa, Cathcart. His works mark an era in the architectural history of Glasgow; coloured decoration and furnishing were also designed by him. He died 22 March 1875, aged nearly 58. A memorial bust by John Mossman was placed 1877 in the corporation galleries of art (B. J., xxxv, 156). *BUILDER Journal*, 1875, xxxiii, 318. *BRITISH ARCHITECT Journal*, 26 March 1875. T. GILDARD, "Greek Thomson", read at Phil. Society of Glasgow, 30 January 1888.

THOMSON (JAMES), F.R.I.B.A., born 22 April 1800, son of D. Thomson of Melrose, was a pupil 1814-21 of John B. Papworth. From 1827-54 he designed Cumberland terrace and Cumberland place, Regent's park, for W. M. Nurse, esq.; also 1838 the Royal Polytechnic Institution in Regent street, and 1848 its theatre adjoining, to seat 1,200 persons, and rearranged the façade; altered the premises in Argyll place for the Union Bank of London; designed the new buildings in Clement's Inn; the Polygraphic hall, King William street, Strand; 1848 the public hall and market-place at Chippenham, Wiltshire; 1845 Alderton church and its village, Wiltshire, for Mr. Neeld, with 1848 restoration of the church of Leigh de la mere; 1848 Royal Hotel at Tenby, South Wales, for E. Morgan; 1850 alterations to Derbyshire Bank at Derby; with houses there for Mr. W. Baker; the laying out of Mr. Roy's estate at Notting hill, and the houses at the east end of Hanover terrace, west of Ladbroke grove; 1851-4 Grittleton house, Chippenham, Wilts., the residence of Joseph Neeld, esq., M.P. (B. J., 1853, xi, 280, 281); 1863 the Russo-Greek chapel, Welbeck street, for the Russian embassy; 1870 grand staircase, and additions to Charing Cross hospital; and other residences. G. W. Browning (brother of E. Browning) of Stamford, was an early pupil. Thomas Porter, F.R.I.B.A., was another. He read at the Roy. Inst. of Brit. Architects, *Composition in Architecture*—*ser J. Vanbrugh*, 15 June 1840; *National Advantages of Fresco Painting*, 6 March 1843; *Hayioscope, etc.*, Alderton church, 28 April 1845, B. J., iii, 205, 222; *Leigh de la Mere church*, 15 May 1848; and published *Retreats—Designs for Cottages, Villas, etc.*, 41 pl., 4to., 1827; 1833; 1840; and *School Houses, etc.*, fol., 1842. He died 16 May 1883, aged 83, and was buried in the cemetery at Finchley. *BUILDER Journal*, 1883, xlv, 705.

THOMSON (JOHN), father and son, *latomi*, were employed 1450 on building the hall at Pyttington, Durham; SURTEES SOCIETY, *Hist. Dunelm. Scrip. Tres.*, 1839, p. 323.

THON (KONSTANTIN ANDRAIVICH), born October 26, 1794, at St. Petersburg, was educated from 1803 in the imperial

Academy of Fine Arts, where he gained several distinctions, ending in 1815. In 1819 he was sent abroad to study, visiting Berlin, Vienna, Rome, Naples, and other places in Italy, arriving 1822 at Paris, and again went to Rome. On his return 23 Dec. 1828 to S. Petersburg, he 1830-33 first designed the building (or the hall) for the academy, with galleries for the antique, solving a difficult problem in construction, with *cléat*; and 1830 designed the church of S. Katherine by the Kolinkin bridge. In 1829 at Moscow, M. Vitberg, oil painter, had made a design for the cathedral of the Saviour, which not progressing satisfactorily, the emperor 1834 desired Thon to make a new design, which he did in the old Russo-Byzantine style; this was finished in the rough about 1833 and was consecrated June 7, 1833, after an outlay of over 60 millions of francs. In 1837 emperor Nicholas desired plans for the large new palace on the Kremlin, on which Thon was engaged for over sixteen years, at the same time designed the new cathedral and restored the old buildings and churches adjoining. VELTMANN describes these works. He designed 1833 a church in Voronezh; 1833 the church of S. Katherine in Tzarskoccelo; of S. Petersburg and S. Paul in Peterhoff; the church of the Presentation of the Virgin in the district of the Sesiouffski regiment of life guards; designed the normal shapes of churches to suit congregations of 1,000, 500, and 200 for the government; besides many other works. In 1842 he designed the small theatre in Moscow, the railway stations at both capitals, with the custom-house attached to that of Moscow; the church for the regiment of chasseurs; restored the steeple of Ivan the great as it was before 1812; and 1853 reconstructed the church of the twelve apostles.

About 1830 he was appointed professor at the academy, which he held for thirty-four years, having up to 1865 educated over 200 pupils, many of whom were sent abroad as pensioners; and A. O. Kaminski who was 1865 engaged as architect on the temple of the Saviour at Moscow. Thon became rector of architecture in the academy. On 1st Sept. 1865 a medal was struck and a meeting held by Russian artists in commemoration of the fiftieth anniversary of the completion of his studies, when at the same time he received other honours from the monarch; he is specially praised for his employment of the old Russian style in his churches. A report of the meeting was printed, also giving a memoir (which with an English translation are in the library of R.I.B.A.), but it is difficult to understand whether all the "projets" not named in above works were carried out. He drew a restoration of *Il tempio della Fortuna Prenestina*, 5 pl., published by NIBEY, fol., Rome, 1825; used by CANINA, *Arch. Ant. Romana*, fol., Rome, 1843, pl. 62-3: published with F. BALLANTI, *Il palazzo de' Cesari sull' monte Palatino*, fol., Rome, 1828: and apparently an *Album* in 1838 of 17 plates, with additions in 1844. A bust of him by Foletti was made in 1850; and in 1882 a Thon medal was founded at the academy for the best architectural design (*BUILDER Journal*, xlii, 655). He died in February 1881. Memoir in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1881-82, p. 56, of which society he was an hon. and corr. member from 10 January 1868. Of two brothers, one, Alexander, was also an architect, and published *Views of Zarskoje Selo*, fol.

68.
THOR. In Scandinavian mythology, the son of the deity Iord. He was considered as the great ruler of the elements of nature, and the protector of all the arts of life. He fought against the great frost giants, and was the god of fire, of agriculture, and of the domestic hearth. He was represented as a red-haired and red-bearded man, holding a ponderous hammer. For the mark "swastika" refer s. v. SYMBOLISM OF FORM (p. 174). 1.

THORAH STONE; see THORA STONE.

THORICUS (now Theriko or Porto-Mandri). One of the demj of Attica on the east coast, north of Sunium, and near the silver mines of Laureium. It was fortified by the Athenians, *cir.* B.C. 408. There are considerable remains of a theatre, of curious and unsymmetrical form (*BURSIA, Geog. v. Griech.*, i, 353, gives a sketch plan); the cavea is nearly entire, but the

seats have been removed since DODWELL's visit; it has a pointed gateway like that at Tiryus. Also an agora, stoa, or portico, considered to have been left incomplete. It is 43 ft. wide, and 104 ft. 8 ins. long on the top step, and consists of seven Doric columns 18 ft. 5 ins. high, at the north and south ends, with fourteen columns on the sides, where is a wide central inter-columniation. SOCIETY OF DILETTANTI, *Unedited Antiquities*, fol., London, 1817, p. 57, 1833. STUART, *Athens*, fol., new edit., 1827, iii, pref., 13, note. LEAKE, *Demi of Attica*, p. 68, 2nd edit. DODWELL, *Cyclopaean Remains*, fol., London, 1834, gives plates of the theatre, pointed gateway, and the Doric edifice. RAMÉE, *Hist. Gén. de l'Arch.*, 12mo., Paris, 1843, i, 412. 2. 23. 25. 28.

THORNHILL (sir JAMES), F.R.S., born 1676 at Melcombe Regis, was of an old Dorsetshire family; learnt painting in London; 1711 travelled through Holland and Flanders; and Feb. 1716-7 was at Paris. He is best known for his painted decorations in many palaces, Greenwich hospital, the houses of the nobility, etc., which exhibit great knowledge of architecture; but perhaps the only building with which his name is associated as architect, is Moor park, Hertfordshire, for B. H. Styles, esq., where he acted as "surveyor"; the design being made by G. Leoni; he "charged the usual commission of five per cent." and had to take law proceedings to recover the amount of his account. A portrait of him was sent by G. C. Handford to the portrait exhibition No. 2, at South Kensington, 1867. He died in "1732 aged 56", or "May 4" (*GENT.'S MAG.* gives May 13) 1734, aged 57, at the family estate Thornhill, near Weymouth (repurchased by him, and where he rebuilt the mansion), leaving a son James, and a daughter married to W. Hogarth; lady Thornhill died 1757 at Chiswick. The staircase of No. 75, Dean street, Soho, is said to have been decorated by him while residing there. DE PILES, *Art of Painting*, 8vo., 3rd edit. (1754), p. 137, App. PILKINGTON, *Dict. of Painters*. NOTES AND QUERIES *Journal*, 1864, 3 Ser., vi, 490. *ATHENEUM Journal*, July 28, 1860, p. 126. WALPOLE, *Anecdotes*, s. v. MULVANY, *Life of Gandon*, 8vo., Dublin, 1846, p. 265. NEALE, *Seats*, 4to., 1819, ii. GWYNN, *Lond. and Westm. Improved*, 4to., 1767, p. 41. DODWELL, *London and its Environs*, 8vo., 1761, v, 12. WOOLFE AND GANDON, *Vit. Britt.*, fol., 1771, ii, pl. 55-6. ACKERMANN, *Repository of Arts*, 8vo., 1825, 3rd ser., v, 127. 14. 68.

THORNTON (ANDREW), a pupil 1765 of B. Manwaring. DOSSIE, *Memoirs of Agriculture*, 8vo., 1768-82, iii, 421.

THORNTON (W...), carpenter, invented the construction to push back the north front of "the great cross isle" which overhung four feet, at Beverley minster, according to the plate published May 17, 1739, "Ed. Geldart del." This was done under the directions of N. Hawksmore.

THORNTON (DR. WILLIAM), made the design for the capitol at Washington. The north wing was chiefly carried out by G. Hadfield, the south wing, etc., by B. H. B. LATROBE, who was 1818 succeeded by C. Bulfinch. DUNLAP, *Arts of Design*, 8vo., New York, 1834, i, 336; ii, 467.

THORNTON (rev. sir JOHN), an amateur, was rector of Bottisford, near Belvoir, from 1782 to 1820, in which year he died December 18, aged 61. "One half of Belvoir castle, Rutlandshire, and certainly the most beautiful portion in an architectural point of view, was erected chiefly from his designs and under his superintendence", after the works 1801-16 by James Wyatt, and the fire of October 26, 1816. ELLER, *History of Belvoir Castle*, 8vo., London, 1841; reviewed in *CIVIL ENGINEER*, etc., *Journal*, 1841, iv, 277.

THOROUGHFARE. The same as PASSAGE except that it implies an opening at each end, which a passage has not always.

THORPE (JOHN). He lived in the reigns of Elizabeth and James I, as shown by a volume of about 280 original drawings, sketches, and designs (some of fanciful forms), now in sir John Soane's museum, of houses of all classes, most of which are of executed buildings. There is also a plan of Henry VII's chapel, valuable as showing the stalls as arranged in 1502; and of Somerset house erected 1546-49. Amongst these drawings are

several specially inscribed; such as "Kirby hall", Northamptonshire, for sir Humphrey Stafford, "whereof I laid ye first stone ao 1570"; (in 1653 it was occupied by lord Hatton); Ampt-hill, Bedfordshire (1577), "old howse enlarged p J. Thorpe"; Wollaton, Nottinghamshire, for sir F. Willoughby "Inchoate 1580-88"; "1600 ½ a front or a garden syde for a nobleman"; "Queene mothers howse faber St. Jarmins alla Paree altered p Jo Thorpe"; Chateau de Madrid, Bois de Boulogne, near Paris; "Mounsier Jammet in Paris his howse"; "St. Jarmins howse v leagues from Paris 1600"; (1606-37) Holland house, Kensington, for "sir Walter Coap pfected p me J T."; "A London howse La Darby channell row"; "Gyddye hall 84 fo square", Essex, altered for sir Anthony Coke; and "Cannons my La: Lakes howse"; (sir Thomas died 1630 and his widow in 1642; hence Thorpe may have died between those years). It has been suggested that Thorpe visited Paris, and that Maria de' Medicis may have sent over shortly after 1611, the plans made by J. de Brosse for the palais Luxembourg, carried out by him 1615-20, for Thorpe's consideration.

Besides these evidences of his work, some references have lately been found by the writer, as "1590, plan of the offices and buildings of the palace of Eltham by Jo. Thorpe"; in *Calendars of State Papers* (No. 78, p. 706): also 1609, where he is named as a commissioner for the king for surveying the duchess of Suffolk's land (No. 83, p. 515): and 1611, warrant to pay various sums amounting to £52 3s. to John Thorp, surveyor, for repairs of the posts, pales, and rails of Richmond park, carried away by the flood in the last winter (p. 76). Another entry occurs "4th of June 1606. More to him for his charges in taking the survey of the house and lands by plots at Holdenby, with the several rates and values of both particularly, with his own pains and three others, a long time employed in drawing down and writing fair the plots of that and of Ampt-hill House, and the earl of Salisbury's, . . . ; £70 8s. 8d."; *DEVON, Issues, Pell Records, James 1st, 4to., 1836, p. 37.* Another reference of importance as conveying the fact of father and son and their place of residence, is "coat of arms azure a star or between three crescents argent, belonged to the abbot of Tame whose name was Thorpe, and now borne of master John Thorpe of the parish of Saint Martins in the field, my especial friend, and excellent geometrician and surveiour, whom the rather I remember, because he is not only learned and ingenuous himself, but a furtherer and favorer of all excellency whatsoever, of whom our age findeth too few;—and lastly, the aforementioned master John Thorpe his sonne, to whom I can in words never bee sufficiently thankfull"; *PEACHAM, The Gentleman's Exercise, etc., 8vo. (1st edit., 1612), 1634, p. 162.* This is mentioned by CUNNINGHAM, in *BUILDER Journal*, 1867, xxv, 206; also that "a short survey is in the Parliamentary reports of Fordyce of the Land Revenue Office" (1798-1802).

The edifices named in this interesting volume of drawings (though some of the minor buildings might be dated) are here arranged in order as nearly as possible. 1546-49 Old Somerset house, for Edward Seymour, earl of Hertford and duke of Somerset. 1560-65 Buckhurst house, Sussex, for Thomas Sackville, earl of Dorset, lord Buckurst. 1564-67 Copped or Copt hall, Essex, for sir Thomas Heneage. 1567-78 Longleat, Wiltshire, for sir John Thynne (and claimed as Thynne's work). 1570 Knowle, Kent, for lord Buckurst. 1571 Theobalds, Hertfordshire, for William Cecil, lord Burleigh. 1575-80 Burleigh, Northamptonshire, for lord Burleigh. 1577 Rowell or Rothwell market-house, Northamptonshire, and 1577 Lyveden, Northamptonshire, for sir Thos. Tresham. 1580 Holdenby, Northamptonshire, for sir C. Hatton. 1580 bef. Toddington, Bedfordshire, for lord Cheyney; (query the "Heddington" of the volume). 1588 Wimbledon, Surrey, for sir Thomas Cecil. 1591 Longford castle, Wiltshire, for sir Thomas Gorges. 1595-1630 Rushton hall, Northamptonshire, for sir Thomas Tresham. 1596 Potters' bar, Monkden Hadley, near Edmonton, for Mr. Tayler. 1598 house for William, earl of Derby (Stow says, then building), plan inscribed "a London

house la Darby channell row" (now Canon). 1607-12 Bramshill, Hampshire, for prince Henry. 1610-16 Audley end, Essex, for Thomas Howard, earl of Suffolk. 1612 *cir.* Little Charlton, Kent, for Robert Filmer (two plans as proposed); and 1618-35 Aston hall, Warwickshire, for sir Thomas Holt. A few others are known, as "Sir George More's house" at Loseley, near Guildford, Surrey; Danvers house, Chelsea, for sir John Danvers; Slaugham place, Sussex, for sir Walter Covert; and Somer hill, near Tunbridge Wells, for lord Clanrickard. Others of the sketches have the owners' names attached, and sometimes the locality; many might perhaps be identified after much research. It is hardly probable that Thorpe could, at that era, have designed all the edifices, and the styles or treatment varies so much. His connection with the edifices has not yet been identified with his name beyond his own notes. Many of the sketches may be memoranda of edifices designed by the SMYTHSONS, STICKELLES, and others, of whom but little is still known. Henry HOWARD. John of PADUA. Richard PALLADY. John THYNNE. Sir T. TRESHAM.

WALPOLE, *Anecdotes*. List of buildings is given in GWILT, *Encyclopædia of Architecture*, edits. 1867, 1876, and 1888: also in *BUILDING NEWS Journal*, 1878, xxxiv. A volume of tracings from the original work, made by C. J. RICHARDSON for his *Architectural Remains*, fol., 1836, is now in the Library of South Kensington museum. *BUILDING NEWS Journal*, 1876, xxx, 194, 342, 466, as to Kirby hall; *Autograph Drawings*, by M. B. ADAMS, 1878, xxxiv, 95, 147, 186, 264. GOTCH, *John Thorpe and the English Renaissance*, in *BUILDING NEWS Journal*, 1884, xlv, 782, 790, and plates. Also in *BUILDER Journal*, 1884, xlv, 764; 780. GOTCH, *English Homes in XVII century*, B. N. J., 1885, xlix, 891, 909, and plates. Also 1857, xiv, 623, as to Longleat. w. p. 1. 19. 68.

THORPE (...), carver, 1601-2 executed "the eight beastes"; 1614-5 "setting on the lion's faces", at the fountain in Trinity college, Cambridge; and 1614-15 does work on the great gate, "the nesettes pictures and armes 6 days at 18d. ixs."; also six crowns and at the arms and battlements; WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., 1886, ii, 438, 628, 629. There was a "John Thorpe", clerk, on the works at the Tower and other places in 1600-1; *BUILDER Journal*, 1883, xlv, 24. Also, on 28 September 1607 three warrants were issued "for the assisting of one Thomas Thorpe with carriages to bring stone out of the counties of Rutland, Lincoln, and Northampton for the building of Aldgate either by land or water at such rates and prices as shall be reasonably agreed on between the owners and himself"; *PRIVY COUNCIL REGISTERS*.

THORVERTON STONE; see RADDON STONE.

THOULOUSE; now written TOULOUSE, in France.

THOUNSANGA. A timber tree of Savoy; see MYRISTICA.

THOURET (NICHOLAS FRIEDRICH VON), born 1767 at Stuttgart, studied at Rome, and on his return was appointed hofbaumeister. He improved the Königstrasse and the suburbs, and redecorated the schloss, at Stuttgart. Designed the theatre at Weimar. Was ennobled and made oberbaurath and president of the school of art. He built the Catherine hospital, begun 1820, and 1826 the brunnenhalle (by Sulzrain) near Kanstadt, as well as the baths at Wildbad. He died January 17, 1845, aged 69. *CIVIL ENGINEER, etc., Journal*, ix, 233. 68.

THOUSAND. In the building trade is generally reckoned at 1,200; as of nails, slates, etc.

THRAUNE; see THROW.

THREE; THE NUMBER. A favourite number with the Templars; RAYNOUARD, *Mons. Hist. — des chev. du Temple*, 8vo., Paris, 1813.

"Around his waxen image first I wind
Three woollen fillets of three colours joined;
Thrice bind about his thrice devoted head,
Which round the sacred altar thrice is led.
Unequal numbers please the gods."

DRYDEN, *Transl. of VIRGIL, Ecl.*, viii, 73.

Wells cathedral approximates in its dimension sufficiently near to suppose that the proportions of thirds was still adopted in practice; CRESY, in GWILT, *Encyc.*, edit. 1888, p. 1025. A certain triplicity pervades all parts of the cathedral at Chichester, which is dedicated to the Holy Trinity; the side shafts, the bearing shafts, vaulting ribs are all in triple; the work of bishop Seffrid who died 1204; KING, *Cathedrals*, 8vo., 1861, p. 299. PROPORTION. TEN. TRIANGLE.

THREE CENTRED ARCH. An arch shaped like the long half of an ellipse. A curious example of this arch, the middle portion being very low, occurs in a window of the gateway at Thornton abbey; RICKMAN, *Attempt*, 8vo., Oxford, edit. 1848, p. 190. Many old arches approaching this form, as at Wimborne minster, are probably due to settlements. BUILDER *Journal*, 1889, lvi, 47, gives a woodcut of the large Norman arch in Tickenote church, Rutlandshire, which has become depressed.

THREE COAT WORK. In plastering, consisting of i, either pricking up or roughing in, according to whether it is lath or brick; ii, floating; and iii, set or finishing coat. The first consists of coarse stuff left rough for the next coat, the second the same with a little more hair, and worked smooth with a hand float, and the third of fine stuff with white hair or a little fine sand.

THREE ELMS QUARRY. This stone, obtained near Hereford, is of the old red sandstone formation, and was used by sir G. G. Scott, 1858-64, in the restoration of the exterior of Hereford cathedral.

THREEWAY COCK; see **FOURWAY COCK**.

THRESHING-FLOOR. A floor in a barn on which wheat is thrashed to obtain the grain from the straw. The word "threshold" was formerly used for the word; NOTES AND *QUERIES Journal*, 1868, 4 Ser., ii, 416. These floors may be made impervious by adopting a cheap method described by J. B. Watson, in BUILDER *Journal*, 1849, vii, 94. Another method suggested in 1804 was that of raising the floor 9 ins. or more above the soil to allow of cats and dogs getting under and so exterminating the vermin. Asphaltic floors are now much used. **BARN. FLOOR (barn).** SMITH, *Dictionary of Antiquities*, 1851, p. 53. JOHNSON, *Farmer's Dictionary*, art. Barn floor. DEAN, *Farm Buildings*, 4to., 1849.

THRESHOLD. The Saxon wold, or wood, forming the tread, step, or CILL, under a door or gate. In Southern Sweden the frames of internal doors are rebated and carried all round, forming a sill on the floor one inch high, on which the door shuts, and prevents draughts; BEAZLEY, in ROY. INST. *BRIT. ARCHITECTS*, 1882-83, p. 126. A patent was taken out Oct. 13, 1874, in Boston, U.S.A., for an "improved door threshold", a substitute for the wide unsightly threshold, in the form of a rod of metal or wood placed on the floor directly under the door, secured but removable at will. SADDLE.

THROAT. The term given to the contraction of the flue of a chimney over the fireplace. The cast-iron chimney hoppers by White, Gibbs, and Edwards render the ordinary throating unnecessary. HOPPER. LINTEL. 1.

THROATING. A sinking chiefly under a projection to prevent water running down the wall (It. *goccia, gocciolatoio*; Fr. *larme*); see BEAK. CORONA. GLYPH. GORGE. GROOVE. LARMIER. QUIRK. RAGLIN. 16.

TRONDHEIM, TRONDHJEM, Throntheim, Trönyem (Ger. Drontheim). A port in Norway, of which it was the former capital until the union with Denmark, and situated on the river Nid. The timber-houses are being rebuilt since April 1841. It was founded 966 as Nidaros. Olaf Haroldson (died 1030) rebuilt in stone the church of S. Clement; this Olaf (S. Olaf) was buried in a sandy hillock near Nidaros, and the body was removed first to consecrated ground near S. Clement's by his son Magnus; and afterwards (1031) into the church itself and enclosed in a shrine. Magnus then erected the stone church of S. Olaf the foundations of which were discovered in 1887. This

ARCH. PUB. SOC.

church was completed by Harold Sigurdson, who brought the shrine and coffin of Magnus into it. Harold (died 1066) then built another church or chapel near one on the sandy hillock, said by tradition to have been erected by Magnus, and dedicated it to S. Mary, and removed or intended to remove the shrine into it; he also commenced a palace near the new church. Olaf Kyrr, his son, aided by Thurgot (formerly prior of S. Mary in Durham) took down the church erected by S. Magnus on the sandy hillock and built the "Christ church", i.e., cathedral, dedicating it to the Holy Trinity; the tomb-house built by Harold remaining until the rebuilding in the XIII cent. Another S. Mary's church was built in the town after the rebuilding of the earlier one as the cathedral.

To the first circular-ailed tomb-house and choir were added the transepts of archbishop Eystein; and there are still existing two arches which show that a nave was intended or possibly built. Then followed the chapel of S. Catharine (sometimes in error called the chapter-house). At the end of the XII or beginning of XIII century, a new tomb-house and choir were erected in place of the earlier ones, and the nave with its great west front (1248) was commenced. In 1328 a fire injured the whole building. The grand screen of columns and arches between choir and tomb-house, which had a domical vault 30 ft. diameter, were (except some portions attached to the choir walls) rebuilt of good Decorated work. The tomb-house was restored, its arches were divided and strengthened by a shaft and arches within them; the triforium reconstructed, but the clear-story and the vault were retained intact, except that the Early English capitals were restored in some instances by the insertion of new carving and mouldings. The style of the triforium is that of Kent and Sussex, and in the tracery is the peculiar split quatrefoil (*ECCLIOLOGIST Journal*, 1859, p. 344). The aisles and the chapels were uninjured and thus retain all their Early English work very perfect. In the XV century, rich screens between the pillars to enclose the shrine replaced the earlier ones. Possibly the choir was restored in a similar way as the tomb-house; but in the rebuilding of the arcades, triforium, and clear-stories, now in progress, the existing fragments of Early English date are adhered to as models. The close similarity both in the Norman and Pointed work to that in England is so great, that it is evident English masons worked upon it; but it is carried out with much greater delicacy than any known English example, though it resembles the fine western porch at S. Alban's (lately destroyed, and stated to have been carved 1195 by the masons Gilbert of Eversholt and Hugo de Goldcliff). The material at the cathedral used for the masonry is a sort of soap-stone which lends itself to this delicate work, with marble for the walls and shafts. The cathedral since 1814 has been the place of coronation of the kings of Norway. The building is 350 ft. Norw., or 360 ft. English, long internally (LAING, says 346 ft.); the choir 64 ft. wide, and the nave 80 ft.: the west front is 120 ft. long. The shrine in 1541 was plundered of its great magnificence. The fires of 1432, 1531 destroying the nave, 1708 and 1719, account for its now ruined condition. The cathedral was commenced to be restored in 1862 by the government, and in 1882 Herr Christie was the architect directing the work (BUILDER *Journal*, 1882, xliii, 808), and under him the church of S. Clement was restored 1873 within and without. MINUTOLI, *Dom. zu Drontheim, etc.*, 12 pl., fol., Berlin, 1853. MUNCH and SCHIRMER, *Tronhjem's Domkirke*, 31 pl. by Le Keux, fol., Christ., 1859. SCHWACH, *Trondhjems Domkirkes Historie og Beskrivelse*, 8vo., Thron., 1838.

The Frue kirke has opera-box-like pews one above another to the ceiling. The palace of the old Norwegian kings is now the military and naval arsenal. A large two-storied timber edifice is the residence of the royal family at the coronation. There is a museum, picture-gallery, and library; a handsome theatre, and a court-house. The hydraulic swing-bridge is described in INST. OF CIVIL ENGINEERS, *Proceedings*, lxxviii, p. 469. LAING, *Norway*, 8vo., 1836, p. 63. ENGLISH JOURNAL, *Two Summers in Norway*,

1841, 8vo., 396. ATKINSON, *Art Tour*, 8vo., 1873, p. 448, describes the statues of the twelve apostles by H. Michelsen. FERGUSSON, *History of Architecture*, 8vo., 1865-67. MURRAY, *Stikkelstad*, p. 202. DALY, *Revue Générale*, 1869, xxvii, 123-5; 1841, fire, ii, 287. FORESTER, *Norway*, in Bohn's "Illustrated Library", 8vo., 1850, p. 266. GAIMARD, *Voyages de la Commission Scientifique du Nord*, 8vo. and fol., 17 vols., Paris, 1842-48. CIVIL ENGINEER, ETC., *Journal*, iv, 144; 1844, vii, 100; xxiii, 153, 180. ECCLESIOLOGICAL *Journal*, 1849, ix, 316; 1856, p. 400; 1859, p. 342. ATHENÆUM *Journal*, 1859, April 16, p. 522. BUILDER *Journal*, 1882, xliii, 808, giving view of interior as restored. R. H. CARPENTER, in ROY. INST. OF BRIT. ARCHITECTS, *Proceedings*, 1887, p. 115-7. R. H. C. 14, 28, 50.

THRONE; EPISCOPAL. (Gr. *θρόνος*; Lat. *cathedra*; *sedes*; Fr. *chaire*; *siège épiscopal*). The seat which as being appropriated to the bishop, was the highest of the seats collectively called *presbyterium* or *concessus*, of the clergy, in the apse of the basilican or primitive churches. This place for the episcopal throne is retained in several Italian churches, as at Sta. Maria at Torcello (COSTADONI, *Osservazioni intorno alla chiesa di Torcello*, 12mo., 1728); and in S. Peter's, in S. Clement's, and S. Lorenzo fuori le mura at Rome, and in other countries. The chair of the abbot was so placed in abbatial churches built previous to the XII cent. VIOLLET-LE-DUC, *Diet.*, ii, 416, s. v. Chaire, has engraved those at Augsburg; in the cathedral at Avignon, no longer in its place; and another later one in S. Seurin or Severin, at Bordeaux. The same author mentions the thrones at S. Vigor near Bayeux; in the cathedral at Toul; and at Mayence. The episcopal seat is now generally placed at the east end of the south side or the epistle side of the stalls in the choir. Over the chair was a canopy of stuff; but after XIII cent. it became a stall of wood or stone with elaborately carved open-work canopies. MAZZOCHI, *Chiesa Cathedrale Napolitana*, 4to., Nap., 1751. S. Aurelius, bishop of Carthage (399) converted the *dea coelestis* (Astarte) temple into a church, and as the figure of the deity was seated on a lion, he put the lion under the "cathedra", perhaps hence the origin of the throne on the backs of lions (at Augsburg, in VIOLLET-LE-DUC, ii, 415) to symbolise the pride of the age subject to the valour or virtue of the cross. The asp, basilisk, lion, and dragon on the throne of marble formerly in the Lateran San Giovanni, is as old as the time of Frederick Barbarossa. It was raised three steps above the ground; this form is retained in most churches of Greece and Russia; and at Rome, in S. Pietro in via Celi, and in S. Stefano Rotondo. In the Greek or Oriental church, beyond the holy table in the extreme east, and in a semicircle, is the archbishop's or bishop's see or seat (*θρόνος*) with seats for his presbyters. BINGHAM, i, 237. GOAR, *Rituale Græcum*, p. 13, etc. EUSEBIUS, *Eccles. Hist.*, x, c. 4; i, 472 in Reading. The proper place of the bishop as officiating priest in the western rite, would be within the altar rails; when not officiating, he takes rank according to his temporal barony and is then seated at the south-east corner or seat of dignities. The foreign bishops being regarded in their churches purely as ecclesiastics, sit at the north-east corner, nearest the spot where their duties are to be performed. BENTHAM, *Ely*, 1771, p. 125, states that the place of the bishop was the first stall on the right hand, the same that the abbots had formerly used. NOTES AND QUERIES *Journal*, 2nd Ser., xii, 350. *Bishops' thrones in Early Churches*, BUILDER *Journal*, 1851, ix, 46, 94, 141, 199. Early thrones, seats, and pulpits in Rome, in GUTENSOHN AND KNAPP, *Basiliken des Christlichen Roms*, 4to. and fol., Munich, 1823, etc. *Annales de Philosophie Chrétienne*, 8vo., 1838, xvii, 426-32. NESSITT, *Churches of Rome*, in ARCHÆOLOGIA, 1866, xl, pts. 1 and 2. DALY, *Revue Générale*, 1852, x, 30-1, gives several examples. *Illustrations*, Canopy, 1855-56, pl. 256-7. CATHEDRA. CHAIR. STALL.

The bishop's throne was formerly of stone, as at Canterbury, Norwich, Avignon, S. Vigor, Reims, etc. At the close of the xv cent., it began to be of wood; VIOLLET-LE-DUC, *Diet.*, 22, 279, 414. LENOIR, i, 205; ii, 115, 239. DUCANGE, s. v. Cathedra. Those

at Augsburg; S. Ambrogio, Milan; S. Stefano, Verona; S. Marco, Venice; and in the choir of the duomo at Ravenna, are mentioned in WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 134, 207, 255, 270, 427. 5. 6. 19. 25.

Durham, 1845-81.

Chalons sur Soane } MAILLARD DE CHAMBURE, *Voy. pitt. en Bourgogne*, Dijon } fol., Dijon, 1833, ii, 34.

Vaison. REVOL, *Architecture Romane*, fol., Paris, 1864-73, ii, pl. 23.

London. Old S. Paul's Cathedral had no bishop's throne; ECCLESIOLOGIST *Journal*, 1843, ii, 51.

Brandenburg.

Rome. S. Cesario. HOPE, *Architecture*, 8vo., 1840, pl. 26.

SS. Nereo ed Achilleo. Epis. chair of Gregory the great.

S. Cecilia. NESSITT, p. 215.

S. Stefano Rotondo. Epis. chair of Gregory the great.

Exeter, 1370 (not 1470 as sometimes stated).

Ely. The seat is by tradition the decanal seat.

Winchester. Of iron.

Wells.

Mantua. The Virgil's chair in the museum is an old episcopal seat. 28.

Ravenna. Pastoral chair of ivory of S. Maximilian, in sacristy of cathedral.

Assisi. In the church. SMIRKE, in ARCHÆOLOGIA, 1836, xvi, 473.

Canterbury. The new one for the archbishop, by G. Austen; BUILDER *Journal*, 1848, vi, 138.

Constantinople. The throne for the preacher, or Kursi, is of one piece of marble in four marble columns; EVLEYA.

THRONE; REGAL (Gr. *θρόνος*; Lat. *solium*; Fr. *trône*).

Frankfurt-on-Main; the *wahlkapelle* or election chapel of the emperors, in the cathedral; over 46 have been crowned; WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 92.

At Teheran; FLANDIN ET COSTE, *Perse*, fol., Paris, 1844, pl. 32.

Futtehpoore Secree; Akber's throne-room in the palace; OLIPHANT, *Katmandu*, 8vo., 1852, p. 198.

Of Attila, at Torcello, in the open air. *North Italy*, 373. 28.

Of Barbarossa, at Gelahausen; HOPE, *Architecture*, 8vo., 1840; pl. 72.

Westminster Abbey church. Coronation chair, 1806-7. TURNER, *Domestic Architecture*, 8vo., 1851, i, 98.

In the House of Lords, Westminster; ILLUSTRATED LONDON NEWS, 1847, x, 293.

Paris. Imperial throne for Exposition of 1867. DALY, *Revue Générale*, xxv, p. 52-4.

The use of brackets in the so-called "throne column" of the Dewan-i-Khas. 78.

THRONE ROOM, of Domitian's Basilica, shown in MIDDLETON, *Rome*, 4to., Edinb., 1885.

THROUGH CARVED WORK. The carving pierced through the substance. "The forepart of the almeries was thorough carved worke to admit air to the towels"; J. D(AVIES). *Ancient Rites*, etc., of *Durham Cathedral*, 12mo., 1672, p. 24, 67, 92. 17. 19.

THROUGH FRAMING. A term formerly in use for "framing all and making doors and windows cost 5s. per square for the workmanship only". 4.

THROUGH HOUSE. A term used at Leeds, Yorkshire, for a house not built back to back. THOROUGH LIGHTED.

THROUGH LIGHTED. A term applied to a room which has windows on two opposite sides. THROUGH HOUSE. 2. 4.

THROUGH or THOROUGH STONE. A bond stone passing through the whole thickness of a wall, generally about one to a superficial yard, binding the ashlar or facing stone with the inner or backing course. It was usual in stone districts, and, as may still be seen in Yorkshire and Derbyshire, to leave the ends of the through stones in walls of a rough character projecting to show the employer that they were properly inserted, the intention being to dress them off afterwards when the work was set, but in many instances this having been neglected, they are still to be seen. S. J. B.

A north country word, pronounced "thruft". Two "throughs" per square yard in walling of uncoursed rubble work is the general practice. DIATONOS. BOND STONE, PARPAING, PERPEN, PIERPOINT, parpoint.

A long stone (a tomb-stone) to mark the burial-place of a person or family; being laid through or over the whole space. Several instances of its use 1548, 1562, 1531, are given in

SURTEES SOCIETY, *York Fabric Rolls*, 8vo., 1859, p. 357. The lid of a stone coffin; DAVIES, *Ancient Rites, etc.*, 12mo., 1672; also "several grave-stones of blue marble and other through-stones that lay upon the priors and the monks"; *idem*, p. 51, 58; 76, 78. 16. 17. 19.

THROWN and THRAUNE. Turned work. Wrought of twisted silk or thread. A turner was anciently called a thrower; HOLME, *Academy*, 1688. A "throwing mill" forms part of the coat of arms of the silk throwers' company. "1582 a fayre thrawne chayre"; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., 1859, p. 270; 357. "Throwen pillars of wainscot", occurs 1556, in the contract for the woodwork in Trinity College chapel, Cambridge. To throw was to turn or twist; hence a turner's lathe is still called "a throw". WILLIS AND CLARK, *Arch. Hist.—Cambridge*, 1886, iii, 662. Pottery made on the wheel is termed "thrown". "Throwne knoppes and floures", COVERDALE'S Bible; *Kings*, iii, vi. 16.

THRUPIN (JHAN), architect or carver of the whole work of the stalls at Amiens cathedral. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Transactions*, 1886-87, pl. xiii.

THRUST. Thrust or pressure is the force which acts between two contiguous bodies, or parts of a body, when each pushes the other from itself. It may be normal or oblique, relatively to the surface at which it acts. The word pressure, although strictly speaking equivalent to "thrust", is sometimes applied to "stress" in general; and when this is the case, it is to be understood that thrust is treated as positive. The horizontal pressure or thrust of an arch is the power of the arch stones considered as a combination of wedges to overturn the abutments or walls from which the arch springs. It tends to push the abutments outwards; in a beam or girder, the forces of tension and compression are equal and opposite, so there is therefore no external horizontal force on the abutments. The smaller the rise of the arch in comparison with its width, the greater *ceteris paribus* will be the lateral thrust. As instances of this truth, may be cited the lofty Pointed arches of mediæval buildings, which frequently sustain enormous weights without exerting great lateral thrust. There is a notion that because they sustain great weights, they therefore ought to do so for the sake of their stability. A concrete bridge, 75 ft. span with 7 ft. 6 ins. rise in the centre, is described in *BUILDING NEWS Journal*, 1869, xvi, 7, which may be considered not to have a thrust. "To determine the projection of a buttress to resist thrust of vaulting", *idem*, 1876, xxx, 381. One of the latest papers is by WALMSLEY, *Theory of Arched Structures*, in ROY. INST. OF BRIT. ARCHITECTS, *Proceedings*, Nov. 22, 1888, p. 55-64. BUTTRESS. COUNTERFORT. EQUILIBRIUM OF AN ARCH. POINTED ARCH. PRESSURE. RESISTANCE. RETAINING WALL. STRAIN. 1.

THRUSTING STRESS. The term (in lieu of strain) used in modern scientific nomenclature for the weight or pressure necessary to fracture or crush a stone or other material; and for finding its resistance; *BUILDER Journal*, 1886, vol. 50, p. 569. CRUSHING STRENGTH. STRENGTH OF MATERIALS.

THUASNE, fireproof system of floors; see FLOOR (FIRE-PROOF).

THUBURSICUM NUMIDARIUM. The modern Khamisa, in Algeria, situated south of Calama. Excavations were commenced 1876 under Masqueray; the forum and amphitheatre were traced, ruins of a theatre of the best period of Roman work, a triumphal arch, a Christian basilica, and walls of many Roman houses, the prototype of the more modern Moorish house. GRAHAM, *Roman Occupation of North Africa*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1885, p. 145. 28.

THUERMER (JOSEPH), born November 3, 1789, at Munich, became a pupil of H. K. von Fischer only in 1817, having Gaertner, Ziebland, Ohlmüller, and others as fellow-pupils. He visited Rome, and then joined Hübsch, Heger, and Koch in an excursion 1818 to Greece, where he remained five months, and on his return published *Ansichten von Athen und seiner*

Denkmäler, fol., 1823-26. He accepted 1827 the post of professor extraordinary at the school of architecture at Dresden; was 1832 first professor; and exerted much influence in taste in art. He published *Architek. Entwürfe und Details—Kunstler in Dresden*, 2 pts., fol.; and with Gutensohn he joined in the first portion of *Sammlung von Denkmälern—der Baukunst in Rom aus dem XV und XVI Jahr.*, 24 pl., fol., 1832, completed in 42 pl., by GRUNER, fol., 1844, with descriptions by HITTORFF. Several plates of buildings also bear his name. He designed the post-office, and carried out the *hauptwache* or guard-house from a design by Schinkel; soon after which he died on November 13, 1833, while at Munich. In 1838 his pupils and friends erected a bronze bust and monument to him at the Academy of Arts. 14. 68.

THUGGA; the modern DOUGGA, Dugga, or Dukhah, in Tunis, situated to the south of the river Bagradas or Majerda. A city formerly covering an area of three square miles and of considerable importance, built on the hill. History is silent as to its origin and development. A four-columned or tetrastyle prostyle temple of the Corinthian order, dedicated to Jupiter and Minerva, and built of a compact white limestone resembling pure marble, dates between 161 and 169 A.D. The portico is 44 ft. wide and 24 ft. 6 ins. deep; the columns 3 ft. 6 ins. diam. and 33 ft. high. The doorway of the cella is 27 ft. high; the lintels 22 ft. long; the jamb 2 ft. 4 ins. wide and 2 ft. 8 ins. thick, being monolithic blocks. The mausoleum supposed erected in IV century B.C., was injured 1847 by sir Thos. Reade in order to obtain the bilingual inscription, which is now in the British museum. The monument was square in plan, two stories high, and with a pyramidal roof of receding steps. The lower story was 21 or 22 ft. square and 10 ft. 8 in. high, and stood on five steps averaging 16 ins. high, with 10 in. treads. Remains of numerous temples, three triumphal arches, theatre, two fountains, several cisterns, and other buildings indicate great magnificence and purity of taste. The monument is given in DONALDSON, *Recent Travels in Algiers and Tunis*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1876-77, p. 38-9, 42, with a plate. He refers to BRUCE, *Travels*, 1768-73, 4to., 1790; the visit in 1832 of F. Catherwood; and to sir GRENVILLE TEMPLE, *Excursions in the Mediterranean, etc.*, 12mo., London, 1835, ii, pl. 73. PULLAN, in NEWTON, *Halicanassus, etc.*, 4to. and fol., 1863, pl. 31. GRAHAM, *Roman Occupation in North Africa*, in *idem*, 1886, p. 169-172, and plate xli; also *Proceedings*, p. 123. GRAHAM AND ASHBEY, *Travels in Tunisia*, 8vo., 1887, which contains a copious Bibliography of the country.

THUIN (JEAN DE), worked on the church (begun 1460 or earlier by LAVENS) of S. Wandru, at Mons, completed 1589; it is 330 ft. long and 110 ft. wide. He died August 26, 1556, and was buried in the church; the inscription records him as "officier tailleur d'image, conducteur de l'ouvrage d'architecte de ceste église". His son of the same name is stated as "ayant exercé le mesure esta", and died October 12, 1596. STAPPAERTS, *Belgique Mont.*, 8vo., Brux., 1840-44, ii, 21-3. COMITÉ ROYALE D'HISTOIRE DE BRUXELLES, *Bulletins*, 8vo., 1848, xiv, 47-8; 539. SCHAYES, *Hist. de l'Arch. en Belgique*, 8vo., 1850-53, iii, 213.

THUJA ARTICULATA, formerly CALLITRIS quadrivalvis; White Cedar. It is common throughout Algeria, most so as one proceeds from east to west. It was highly prized by the ancients. PLINY (*N. H.*, xiii, 29; xvi, 24, 34) notices that the Citrus, as it was called by the Romans, was so rare that tables made of it fetched enormous prices; the largest sections known to him were 4 ft. 6 ins. diameter. Cicero gave a million of sesterces (250,000 francs or £10,000) for one of them; one table belonged to Juba, the Moorish king. The root, with its knots, afforded the most prized portions, and though usually used for inlaying and veneering, the emperor Commodus had vases and cups made of it. The figured parts were called "Tigerwood" and "Pantherwood" according to the curling veins or concentric spots. No wood is so full as this, of spots, satiny lustre, and variegated veins; it takes a perfect polish; the hues pass from

deep fiery red to those of the pinkest mahogany; and these tints are permanent, not fading like rosewood, or becoming black like mahogany. The *arbor vite*, *cupressus thuyoides*, or white cedar, attains a height of 40 to 50 ft.; its wood is of a reddish colour, very light, soft, and fine-grained, and much used in house carpentry. *Thuya Occidentalis*; American *arbor vite* (Fr. *cedre blanc*), MICHAUX, *N. A. Sylva*, 8vo., Phil., 1817-19, iii, 241; 1850, 2nd edit. These are both employed for sleepers and other purposes to which the red cedar is applied, but the latter is preferred.

It is the *alerce* of the Moors. This tree, called in the Arabic dialect of Granada, *Erza*, *Ere*, the *Eres*, of the Hebrew, the *Larix* of Barbary (the root of *LARIX*; the Larch), is the *THUYA*, or *Thus articulata*, or *arbor vite*, which in the time of the Moors grew plentifully near the Gumiél as it still does in the Berber mountains beyond Tetuan from whence it was brought. Cedar timber was found preserved in the temple of Apollo, at Utica, near Carthage, about 2,000 years old. The Gothic retablo 1482-1550 of the high altar in the cathedral of Seville, unequalled in size and elaborate detail, is said to be of *alerce*, with which the plains of Tablada, near Seville, were covered in the time of the Goths. The roof of the mosque at Cordova, finished 794, when taken down in 1713 was found to be as sound as when put up; the planks were much sought after by guitar makers. The existing ceiling, an *artesonado* dome of wood, in the sala de los embajadores, at Granada, is composed of the *alerce*, being darkened by time. FORD, *Handbook to Spain*, 7th edit., p. 180, 228, 308, GIRAULT DE PRANGEY, *Essai sur l'Arch. des Arabes*, 8vo., Paris, 1841, p. 35; 126. BUILDER *Journal*, 1859, xvii, 249, 562. STEVENSON, *Building Materials of United States*, 1841; CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 267. HOLTZAPFEL, *Descr. Cat. of Woods*, 8vo., 1843, s. v. "Arbor Vite". HOOKER, *Notes on the Paris Exhibition of 1855*, "Woods of Algeria". 14. 28.

THUMB; see **LAT. POLLEX**; and **FOOT**. "Rule of thumb", is a term for a rude method of carrying out work from memory or habit, without scientific knowledge.

THUMB LATCH. A handle to a door, combined with a plate fixed on a pivot going through the door, which on being pressed down by the thumb while the hand grasps the handle raises the latch out of the catch in the post and frees the door. KEEP. SNECK. Norfolk and Suffolk latch; see **LATCH**.

THUMB MOLD. A round bold moulding formed by tracing the outline of a thumb. It is a sort of long bead.

THUNDERBOLT (Fr. *foudre*). An ornament carved in the manner of broken flames with darts or arrows, placed in the soffit (*plafond*) of the cornice of the Doric order; VITRUVIUS, iv, 2. It is also seen in the composition of some capitals. 25.

THUNDER ROD. A former name for **LIGHTNING CONDUCTOR**. 14.

THURA (Gr.), *thuresi*, *thureos*, *thuroma*, *thyrorea* (Lat. *Janua*). The door of the Greek temple or house. "The silver jambs (*σθαυροι*) of the golden doors (*thurai*) with a silver lintel (*uperthuron*) and gold coronæ to the palace of Alcinoüs"; HOMER, quoted in INWOOD, *Eretheion*, fol., 1827, p. 55-6, 63, 94. 78.

THURA or **THURAH** (LAURITZ DE), born 1706, studied at Copenhagen; travelled in France and Italy; became hofbaumeister at Copenhagen, where he built 1736 the royal palace at Hirschholm; the "Eremitage" in the Thiergarten; the prince's palace behind the Schloss; 1749 the tower of S. Saviour's church, the spire of which is formed by an open staircase rising to 238 ft. from the ground; and the church of Our Lady destroyed 1807; its site is now occupied by the Thorwaldsen museum. He died 1797. 68.

THURING (NICHOLAS); see **THEURING** (N.).

THURIUM, founded by the Athenians on the ruins of Sybaris, in Magna Græcia. HIPPODAMUS laid out the new city B.C. 443 or 446. The period of its final decay is uncertain, but it seems to have been abandoned during the middle ages for Terra nova, more inland. 23.

THÜRMER (JEROME); see **THUERMER** (J.).

THURSTONLAND RED BRICK AND STONE. Near Huddersfield in Yorkshire; see **ELLAND EDGE**.

THUSCI. Tusci or Etrusci; see **RASENA**.

THUYA; see **THUJA**, or white cedar.

THWAITE. A term used in the West Riding of Yorkshire, for a level pasture field; **ARCHÆOLOGIA**, 1814, xvii, 161.

THYATIRA. The modern *Acsá*; and *Akhissar*. A town of Lydia. No trace of any early building remains. A view from Windmill Hill, in PULLAN, *Photographs*, 1876. ARUNDEL, *Seven Churches*, 8vo., 1828, p. 189, 269-74. 14. 28.

THYBISCUS. An ancient name of TEMESVÁR, in Hungary.

THYMELE (Gr.). A sort of altar surrounded by steps, placed in front of the centre of the stage or orchestra of a Greek theatre; here the coryphæus or spokesman took his stand, when the chorus was not singing, so as to be ready. BULINGER says "in Greece, the scene was higher than the proscene, and the proscene than the pulpitum or thymele". BOETTICHER, *Die Thymele der Athena Nike*, 1880. LIB. OF ENTERT. KNOWLEDGE, *Pompeii*, 8vo., 1831, i, 235, 237. Some large blocks in the theatre at Assos are supposed to mark the thymele or place for the musicians. SUIDAS explaining the scene, says that in the orchestra is the altar of Bacchus which is called thymele. 78.

THYNNE (sir JOHN). A "William Thynn alias Bouteville", was clerk of the kitchen, and master of the household, to king Henry VIII. His nephew and successor JOHN, "an ingenious man and a traveller, was taken into the service as secretary of the protector Somerset" (HOARE, *Modern Wiltshire*, fol., 1822, i, 69-73), who knighted him on the battlefield of Pinkie (1547) or Muscledborough, and thus he is said, for him, to have built Somerset house 1567, "an unfortunate mixture of Greek and Gothic" (MILZIA, *Lives*, ii, 159). Thynne in 1540 bought Longleat, Wiltshire, and began building 21 Jan. 1567; the books of accounts continue to 28 March 1578, when £8,016 13s. 8½d. had been spent. He died in 1580, by which time a large portion had been erected, as the outside shell, 220 ft. by 180 ft., and from the hall to the first side of the chapel court was finished inside, but no part of the whole west side was finished. His son John added the balustrading, chimney tops, some towers, and screenwork in the hall; JACKSON, 4to., 1857, and in BUILDER *Journal*, 1856, xiv, 623. AUBREY, 1686, and GILPIN, *Western Tour*, 8vo., 1798, p. 125, attribute the designs of Somerset house and Longleat to "John of PADUA" (R. PALLADY). At Bradford, Wiltshire, is a house built for John Hall, who married 1561 a daughter of sir John Thynne; the design is the same as that of Longleat; it was later called "The Duke's house" and "Kingston house"; RICHARDSON, *Observations*, 1837, p. 10, 21, and three plates.

THYROMA. The Greek name for an entrance door or doorway. VITRUVIUS, iv, 6, 1. JANUA. **THURA**.

THYROMÆUM. A passage in the house of the ancient Greeks, at one end of which was the entrance at the porter's rooms, and at the other, the doorway leading to the peristyle. **THURA**. 2.

THYSRUS (Fr. *thyrs*; Lat. *Hasta pampinea*, from the spear-head being buried in vine-leaves). A pole carried by Dionysus, and by satyrs, maenades, and others who engaged in Bacchic festivities and rites. It was sometimes terminated by the apple of the pine or fir cone: or a bunch of vine or ivy-leaves with grapes or berries arranged in the form of a cone: also a white fillet was frequently tied to the pole just below the head. It is very often introduced into decoration, as at Pompeii. Museo Pio Clementino, iv, pl. 10, has two good representations. RICH, *Dict. of Gr. and Roman Antiq.*, 8vo., London, 1860, new edit., p. 331; 661. 6. 25. 78. 79.

THYSDRUM or **THYSDRUS**; also *Tedres*, *Tisdra*, *Tisdro*, *Tisdrus*, *Tusdra*, *Tusdrus*, *Tysdra* (Fr. *El-gemme*), now *EL-DJEM*, also *EL-JEM*, *el-gemme*, *el-jemme*, *el-legem*, *jemme*, *jommel*, or *Jimmel* (of SHAW), *Legem*, and *L'Jem*. A city of Byzacium, in Roman Africa, about 42 miles south of Kairouan, in Tunis.

The site is near the amphitheatre, which may date about A.D. 238, the time of emperor Gordian; it covers $4\frac{1}{2}$ acres of ground, is at least 120 ft. high, and capable of holding more than 30,000 persons. The stone was obtained from the quarries at Salleta about twenty miles distant. The major axis was about 439 ft., the minor about 403 ft. There are a number of tombstones. GRAHAM, *Roman Occupation of North Africa*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1886, p. 165-9; and 3 plates. GRAHAM AND ASHBEY, *Tunisia*, 8vo., 1887. SHAW, *Travels in Barbary*, fol., Oxford, 1738, and 4to., London, 1757, i, 220, was the first to see the place, and BRUCE, *Travels*, 1768-73, 4to., 1790, to sketch it. GIBBON, *Decline*, 8vo., edit. 1853, i, 222. ISTITUTO DI COR. ARCHEOLOGICA, *Monumenti*, fol., Rome, 1829-84, v, pl. 42-4. 23.

TIAHUANUCO. The "Baalbec" of the new world. A village in Bolivia, on the lake Titicaca. It is greatly deserted but is remarkable for the ruins and gigantic monuments that are found in great numbers in the vicinity. SQUIER, *Peru; Incidents of Travel*, 8vo., London, 1877, describes the temple, fortress, hall of justice, monolithic gateway, elaborate sculptures, etc.; p. 11, 269-307. TSCHUDI, *Travels in Peru* (by Ross), 8vo., London, 1847, p. 294, pl. 46. CASTELNAU (count F. de), *Expédition dans les parties centrales de l'Amérique du Sud*, 8vo., 4to., fol., 7 pts., Paris, 1850-59; and his *Voyage dans l'Amérique septentrionale*, 1837-41, by Duponchel, 8vo., 1841, etc.

TIBALDI (PELLEGRINO PELLEGRINI, called II); also Pellegrino de' Pellegrini da Valsoldo di Mira, son of a mason and native of Valsolda in the Milanese, who adopted the name of Tibaldi. He was born 1527 at Bologna (BIANCONI), or 1522, at Milan, and studied painting under several masters. In 1547 he visited Rome for study, and relinquished that art for architecture under Buonarroti. At Milan, he designed 1560 the façade (Italian) of the duomo, which was approved by San Carlo Borromeo and was commenced 1587-1600 by M. Bassi, but Gothicised later. On 7th July 1567 he was appointed architect to the cathedral, and first engineer to the government, which he retained until 1586 being succeeded by M. Bassi. (GAYE, *Carteggio*, 1840, iii, 446, prints a letter dated 21st Sept. 1582 signed by P. as "arch. del domo di Malano.") He designed the decoration to the inside of the great entrance-door; raised the choir with the crypt (Italian) of S. Carlo under it (rebuilt 1817 by P. Pestagalli), designed 1584-7 the pavement, the baptistry in the north aisle, the windows in the nave and the stained glass, twelve coloured drawings for which by him are still in the biblioteca Ambrosiana. MILIZIA refers to, four points of contest between Pellegrino and Bassi in the designs of the former. He also designed 1569-79 the church of S. Fidele de' P. P. della Compagnia di Gesù, on the site of the old church of Sta. Maria in Solariolo (CASSINA), it was completed by M. Bassi; (the high altar 1821, and the façade 1835 are by P. Pestagalli). The church of the Beata Vergine di Rò, completed by M. Bassi. (*Breve racconto dell' Origine e de' Progressi dell' insigne Tempio di N. S. detta de' Miracoli presso il borgo di Rò*, 12mo., Mil., 1756.) The church de' Gesuiti, with a façade of two orders. He rebuilt 1574 the basilica of S. Lorenzo Maggiore with an octangular dome of equal sides raised on a basement of unequal sides; some authors attribute it to G. Cucco; it was carried on by M. Bassi who had completed it except the dome at his death in 1590, when it was slightly varied; the interior was rebuilt like that of S. Vitale at Ravenna (*Raccolta dell' Intorno, etc.*, Milano, fol., 1623). He designed 1574-77 the round church of S. Sebastiano, carried out by F. Mangone, of which the first stone is said to have been laid 7th Sept. 1577 (*Raccolta, etc.*); and those of S. Andrea Apostolo, and of S. Raffaele; and designed or restored the archbishop's palace. The collegio Elvetico now the palazzo della contabilità generale is attributed to him but it was erected 1617-29; as is also the church of the Madonna presso S. Celso, the portico of which is by C. Solaris. He designed the palazzo Erba Odescalchi now Pensa (CASSINA); and while the lazaretto outside the porta orientale 1489-1507 is attributed to him as

ARCH. PUB. SOC.

well as to Bramante, he certainly designed its chapel (DURAND, *Parallèle*, fol., Paris, 1801, pl. 30; LATAUDA, *Descr. di Milano*, 8vo., Mil., 1737-8, i, 213-7); and 1591 the (merchants') casino della Società del Giardino, or palazzo Spinola, then Cusani until 1816, which is also attributed to V. Seregni (CASSINA).

Among other architects he made a design for the Escorial, for Philip II of Spain, who 1587 sent for him, in place of Barozzi, to paint the interior, to rebuild the royal palace, and for various other works, which he accomplished during several years, and was created marquis de Valsoldo da Mira. At Ancona he executed a framework of stucco work round the picture of the high altar in the church of S. Ciriaco sul Monte, and another in S. Domenico, in the town; designed the loggia dei Mercanti, an adaptation of Gothic architecture, and executed the paintings in it; the palazzo Ferretti; the prisons for 450 criminals; and took charge of the defences, as well as of other towns in the former States of the Church, more especially at Ravenna. At Novara, he designed the collegiate basilican church of S. Gaudenzio, revised and continued by M. Bassi; it is one of the finest in Lombardy; also 1527-1590 several of the palaces, among them the palazzo Bellini. At Bologna, the Poggi chapel, cir. 1570, in S. Giacomo maggiore; two large stories to the palazzo Poggi (afterwards Celesi, and Banchieri, and later the istituto delle scienze), with its noble chapel, in the via San Donato, and decorated it with frescoes (it was carried out by G. Alessi; the cortile by B. Triacchini). Also the great court of the palace of the inquisition, using the Doric order with metopes of a double square in length (ZANOTTO, i); designed the church of S. Giacomo, and S. Felipe (Malvasia); della Madonna presso S. Celso; and Spirito Santo or S. Felice. At Pavia, the collegio Borromeo, founded 1563 by S. Carlo, its cortile, loggia, etc.; and outside the town, a church of two orders inside; the outside incomplete [probably the church della Sapienza, first stone laid 1564]. At Genoa, he designed the casa professa, or church and residence of the Jesuits, described at some length by MILIZIA for its convenience in a very irregular situation; also the round church of S. Sisto, which was completed 1825, consecrated 1828, and altered by G. B. Resasco. At Varese, near Milan, he designed 1507 the church of S. Vittore, the façade 1791 is by Polack. Near Caravaggio, he 1575 designed the sanctuary of the Madonna. At Gropello, a villa belonging to the archbishop of Milan. At Turin, 1577 the church or cloister of SS. Martiri of the Jesuits; and also works at Recanati, Civita Novi, and other places. He died about 1598 at Milan, and was buried in the duomo (MUZZI); 1591 (according to BIANCONI); aged 60 years, i.e., 1582, at Milan (VIRLOYS); or 1592 (MILIZIA). MUZZI, *Annali Bolognesi*, 8vo., Bolog., 1844, vii, 340-3. QUILLIET, *Les Arts Italiens en Espagne*, fol., Rome, 1825, p. 54. DE PILES, *Art of Painting*, 8vo., 1745, 3rd edit., 146, who calls him Pellegrino Tipaldi, otherwise Pellegrino da Bologna. ZANOTTI, *Storia dell' Accad. Clement. di Bol.*, 4to., Bol., 1736-39, i, 28, 48, 49; and *Pitture di Pellegrino Tibaldi, etc.*, fol., Ven., 1756.

3. 5. 12. 14. 25. 28. 30. 38. 65. 94. 105.

TIBALDI (DOMENICO), also called D. Pellegrini of Bologna, probably a younger brother (MUZZI), or a son of P. Tibaldi, was born 1540 or 1541; was a painter, and engraver on copper. He practised architecture at Bologna, where 1575 he designed the capella maggiore in the cathedral of S. Pietro, considered to be superior to any in Rome, and preserved in the new building 1748-51 by G. A. Magenta: 1577 the palazzo arcivescovale on the north side of the duomo: 1581 the church of the Madonna del Soccorso: a palazzo della Gabella, Mattei since 1801: part of the zecca or mint (LANDI): the small temple of the Beata Vergine del Borgo su le mura: the church delle Convertite, since suppressed: the great door of the palazzo maggiore or pubblico, in which was placed the statue of pope Gregory XIII: the palazzo dell' antica dogana, late Mattei: the palazzo Magnani, now Guidotto, via S. Donato, the two orders are without entablatures (LANDI): cortile of the palazzo del istituto (LANDI):

church of the ospedale di S. Francesco (LANDI); façade of the palazzo Marescalchi: some works in S. Petronio; and 1583 the church of Sta. Maria delle Laudi, or Compagnia dei poveri (modernised 1800 by F. Tadolini), and carried out after his death, which occurred in 1582 aged 42 years (VIRLOYS); or 1583 aged 42 years and five months (MUZZI); and was buried in the suburban church of San Annunziata, leaving a numerous family. LANDI, *Raccolta di palazzi di Bologna*, fol., Bol. (16 . .)

TIBALDI (PAOLO), of Milan, worked at the church of S. Petronio in that city. He died 1453. 105.

TIBALDI de' Santi Giacomo e Filippo, designed the church delle Convertite, at Milan (p. 169). 105.

TIBERIANUM of the Romans; see BAGNACAVALLI.

TIBERIANUS; LAPIS. A name given to the green serpentine stone of Egypt, obtained from quarries near Deir. It is also called the green marble of Augustus, being first used in Rome in his time. BRINDLEY, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1888, p. 24.

TIBERIAS. The chief town of Galilee, in Syria. There was a royal palace (Hadrianeum) and a stadium. The town was built by Herodes Antipas in honour of the emperor Tiberius: it was greatly injured by the earthquake of 1 January, 1837. 23.

TIBETAN ARCHITECTURE. Tibet (native, *puë-kaochin*; Chinese *Tsong*; Hindoo *Bhot*), is the most southern of the three great table-lands of middle Asia. It has been occupied by the Chinese since 1272 under the emperor Kang-he. The Thü founded an empire in northern Tibet in the VI century; hence the names Thü-pho, thupo, töbtö, tebet, and thibet. Little more is known about the country, or of LASSA or H'ASSA, its capital, of which capt. TURNER, *Embassy to the Court of Teshoo Lama*, 4to., 1800, was the first to describe. GAYA, TESHU H'LUMBU. A lamasery, the Buddhist monastery, is a collection of small houses built round a Buddhist temple for the lamas or priests living in community; in their vicinity or on hills are the monumental towers of the Lama. Chan-si, the five towers, is the hallowed ground. A plan of a temple has not yet been obtained; its courtyard or inclosure has colonnades on three sides, with painted figures. "In Tibet, the sloping walls of the houses is a marked characteristic. Stones, or sun-dried bricks, are the building materials (described by SIMPSON), and there is little or nothing of an architectural character, height being one characteristic, perhaps for defence (as in LEH, *Ladak*, pl. 35). The arch is not used, and the lintel over an opening is formed of small timber laid in tiers crosswise until sufficient strength is produced, the ends suggesting the use of dentils on the old Buddhist works, formerly and naturally ascribed to the Greek influence, but lately doubted." RITTER, MOORCROFT, KLAPROTH, KIRCHER, and other old writers. HUC, *Travels in Tartary*, etc., transl. by Hazlitt, after 1846. PRINSEP, *Tibet, Tartary, and Mongolia*, 8vo., 1851. GILL, *River of Golden Sand*, 8vo., 1880. SIMPSON, *Architecture in the Himalayas*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1882-83, p. 74-5. ENCYCLOPEDIA BRITANNICA, 1888, 9th edit., and its bibliography. FERGUSSON, *Indian and Eastern Architecture*, 8vo., 1876, p. 311. GARNIER, *De Paris au Tibet*, 8vo., Paris, 1882. SCHLAGINTWEIT, *Le Bouddhisme au Tibet*, 4to., 1881. ROCRO, *Ricordi dei Viaggi al Cashemire medio Thibet*, 3 vols., 8vo., Turin, 1881. 14. 50.

TIBILIS, now (Arab.) Announa, in Algiers. The remains may be assigned to the IV century; its ruins cover a large area, and comprise a triumphal arch, a triumphal gateway of two arches, another monumental arch, and a Christian basilica, all built of fine limestone and sandstone. GRAHAM, *Roman Occupation of North Africa*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1885, p. 143-5. GRAHAM AND ASHBEE, *Tunisia*, 8vo., 1887. BERBRUGGER, *Algérie historique*, fol., Paris, 1843; and DELAMÈRE, *Algérie* (Archéologie), pl. 164-6.

TIBUR. The old Roman name for TIVOLI, in Italy.

TIBURTINE STONE. The name formerly given by writers to the TRAVERTINE STONE obtained near Tivoli, and used at Rome after the earlier works. PEPERINO.

TICINUM; see PAVIA, in Italy.

TICUL in Yucatan; see IZAMAL, and KABAH.

TIE; see ANCHOR. ANGLE TIE. BAND. BOND. CHAIN. DOG TIE. DRAGON TIE. HOLLOW WALL. LAND TIE. STRAP. STRING COURSE. TIE ROD. WALL TIE.

TIE-BEAM (Lat. *tignum*; Fr. *entrait*; Gr. *transtrum*). The horizontal beam connecting the lower extremities of the rafters of a roof. VIOLETT-LE-DUC, *Dict. (Construction)*, 182-6, 189; 270. FOOTING BEAM. FOOTING DORMANT. ROOF (p. 675). TIE-ROD. 1. 5. 25.

TIEL; see THEODORICUS.

TIENTSIN; see CHINESE ARCHITECTURE (p. 136).

TIERCE POINT (Fr. *tiers-point*); see THIRD POINT. 1.

TIERCERON and TIERCELET. The French term for a rib in Gothic vaulting placed third, or between the former (which is against the wall) and the diagonal ribs. WILLIS, *Architecture of the Middle Ages*, p. 83. GARDETT, *Principles of Design*, 1863, p. 170-190. 16. 25.

TIERED. In 1654 the roof of the old town hall at Liverpool was ordered to be lathed, tiered over, and made handsome; LIVERPOOL ARCHITECTURAL, ETC., SOCIETY, *Transactions*, 8vo., 1848, i, 40. TORCHED.

TIE-ROD. The use of wrought iron tie-rods instead of heavy timber tie-beams is now 1853 becoming so common in the framing of roofs, as to render it necessary to find an exact method of ascertaining the diameter required for such rods in roofs; this is given by TARN, *To find the diameter of wrought iron tie-rods*, in *BUILDER Journal*, 1853, xi, 771-2. SPON'S *Architect's Price Book*. RONDELET, *L'Art de Bâtir*, fol., 1830-32, pl. 149, 150. PASLEY, *Course*, 4to., Chatham, 1826, p. 175-85 (reprinted 8vo., 1862), treating of the history of arched floors, does not warn the reader as to thrust; describes works by sir J. Soane; by sir R. Smirke; and by J. Nash, the latter using tie-rods at Buckingham palace; he refers to BELIDOR, *Science des Ingénieurs*, fol., 1729, and by NAVIER, fol., 1814, for the floors of barracks in France in the early part of the XVIII century, and concluding with S. Smirke's account of the fall of a mill at Salford, to call attention to the necessity of tie-rods. In the churches at Milan, and many other places in Italy, the two sides of all the arches are connected with each other by iron bars or ties; WOODS, *Letters of an Architect*, 4to., 1828, i, 211. So also they may be seen in many mediæval buildings in England. "Experiments on iron ties through party walls" to form a continued bond for the floors of adjacent houses, by PASLEY, are recorded in CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 41-2. BRICK ARCH. TENSION ROD. TRUSSED GIRDER.

TIETLANDUS and Thietland. Apparently an ecclesiastic in the Benedictine church and monastery at EINSIEDELN; Eberhard, founder and bishop, began it 934, and confided the works 945 to Tietlandus, "extremely skilful in building", who 948 succeeded him in the abbacy. He is considered to be the same person as Tietlandus of Goslar, flour. 910. 3. 68.

TIFERNUM TIBERINUM; the modern CITTA DI CASTELLO.

TIGNARIUS (Lat.). A timber worker; strictly one who hews and puts together the timbers of a roof. This was a trade by itself among the Romans, and was incorporated. GRUTER, *Inscrip.*, 360, 2. Also, applied as a builder, including all those engaged in any description of building operations. SCHUBLER, *Scenographia Artis Tignaria*, fol., Nur., 1736.

TIGNUM (Lat.). A beam or timber for building; generally applied to the tie-beam of a roof; VITRUVIUS, iv, 2, 1. In stone edifices of the Doric order, the ends are represented externally by the triglyphs.

TILBURSTOW QUARRY. About a mile and a half south of Godstone, the bottom beds of the lower green sand formation rise suddenly at an angle of 45° to form the escarpment of Tilburstow hill. The strata vary in texture and composition from the state of soft sandrock to that of irregularly shaped nodular masses of great hardness, in most cases tinged with oxide of iron, of various shades, from whitish grey to a deep

ferruginous brown. The harder stone from this hill can hardly be distinguished from the Kentish rag-stone, while the softest sandrock may fairly be considered identical with the "Hassock" of the Kentish Rag district. The advantage of obtaining the stone from this hill is, that it is twelve miles further west than any other place where the rag-stone can be obtained. The south aisle of Godstone church was built with it about 1852. C. H. SMITH, in Roy. Inst. of Brit. Architects, 15 January 1855.

KENTISH RAG.

TILE (Lat. *tegula*; It. *tegola*; Sp. *teja*, *tega*, *tegilla*; Fr. *tuille*, *carreau*; Ger. *ziegel*, *dachziegel*). A flat, or curved, cake of baked clay used for roofing and other purposes; also a flat cake used for paving. Roman roof tiles are well known; some were found at the villa at Walesby, Lincolnshire; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1862, p. 138, and cut. The church at Shaw is curious for being roofed with Roman antique tiles; BIBLIOTHECA TOPOGRAPHICA, xvi, 80. On Roman Bricks and Tiles, by JANNICKE, in the "Sprechsaal"; and in BUILDER JOURNAL, 1883, xlv, 7. WRIGHT, *Oelt, Roman, and Saxon*, 8vo., 1861, 2nd edit. "Not far from S. Katherine's hostel was the tiled hostel, or the hostel of the tiler, commonly called the tylers, and tyled hostel. A former possessor of it had been one John Tyler, and it was roofed with tiles, a material other than that used for the rest of the hostels," *cit.* 1449; CAIUS, *Hist. Cant. Acad.*, i, 49; quoted in WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 8vo., 1886, ii, 426. It is stated by DE LA QUÉRIÈRE, *Girouettes, Epis*, etc., 8vo., Paris, 1846, that at Rouen all the houses of the xv cent. were covered with tiles, the churches at the end of the same century, and the halls, but from the reign of Louis XII (1498-1515) the use of slate gradually spread; but tile still served for roofing until the commencement of the xviii cent. By the Act 17 Edward V, c. 3, 4, 1477-78, it was ordained that for good tiles, clay should be dug before November, stirred, and turned before March; tiles were also to be of three sorts, plain or thak—gutter or corner—and roof, crest or ridge—which were sold by the hundred, in some places of six score, some of five score, all assigned by the statute.

| | |
|--------|---|
| Plain | 10½ ins. long, ½ ins. thick, 6½ ins. breadth. |
| Gutter | tile 10½ " with convenient thickness and breadth. |
| Ridge | 18 " ½ and ½ of ½ with convenient breadth. |

JEAKES, *Arithmetic*, 1701. Thak, waule, and rigge, tyles, were so called in 1632; POULSON, *Beverlac*, 4to., 1829, p. 640.

One of the best made tiles is from the Kennington and Naccolt tile-yards, at Ashford, Kent. The Naccolt tile-kilns formed part of the royal manor of Wye, and were given by William I to found the abbey at Battel, and the abbot and his brethren became large manufacturers. In 1318 the bailiff returned the sale of 52,000 at 3s. 3d. per thousand; in 1369 and later, increased quantities were sold, including corner, gutter, and festeux; FURLEY, *History of the Weald of Kent*, 8vo., Ashford, 1871-74; HARRIS, *History of Kent*, fol., 1719. They were sold in 1275; ROGERS, *History of Agriculture and Prices*, 1259-1793, 8vo., 1866. The clay is a natural one, and so light that 1,400 tiles weigh a ton only, being about as heavy as slate. They are brown in colour, and ring like iron. The statute of 1477 is still followed; then clay is ground slowly by horse power, and the tiles made by hand. The "Brosley" process of moulding makes them hard and brittle. They have lately (1887) been used at the new hotel at Tilbury Docks, to cover the outer walls, on account of their lightness and colour. "Yorkshire tiles" from Grimsby were considered in 1861 to be of very good make. "Staffordshire tiles" are those generally used; they have two lips or projections at the head for hanging on the sawn laths. The clays used for tiles should be finer than those used for ordinary bricks. CREST; DORMANT and DORMER; GUTTER; HIP; MATHEMATICAL; PAN; PLAIN TILE; RIDGE; STRAIGHT; THAK; TILING. 1. 14. 16. 17. 19. 25.

The chief objection to the use of tiles is their weight, and to their absorbing water. It has been proposed to impregnate them

with oily or bituminous matters, or to increase their density; but these methods would add to the weight of the tiles, so a lead varnish has been applied to the exposed surface. BRONGNIART states that this varnish is composed of twenty parts of ground litharge and three of manganese with enough clay and water to make the mixture a thick paste. In Germany, a glaze has lately been composed of sea salt, litharge, and a little red ochre, and applied by throwing the mixture upon the incandescent fuel so as to volatilize it in a similar manner to that adopted for the common salt glaze. GLAZE. (ARCHITECT JOURNAL, 1887, May). Varnished tiles of various colours were much used in Italy and Spain during the middle ages, sometimes in combination with ornamental ridges. The Ludwigs kirche by Gaertner, which was roofed with coloured tiles, after a year's wear had to be replaced by metal; in 1845 water came in and did much injury; WEBB, *Continental Ecclesiology*, 8vo., 1848. Painted tile for paving, 22 Henry III (1237-38), described in TURNER, *Dom. Arch.*, 8vo., 1851, p. 253. Coloured tiles, in DALY, *Revue Générale*, 1854, xii, pl. 28-31; and xiii, pl. 1. ATMOSPHERIC. EARTHENWARE. POTTERY.

Among the many varieties of tiles in use are:—

- 1840 Brown's Italian tile; and Gothic ridge tile; B. J., iii, 563. SOCIETY OF ARTS, *Transactions*, 1856, p. 6. CIVIL ENGINEER, ETC., *Journal*, 1844, vii, 429; viii, 81.
- 1877 Poole's patent bonding roll roofing tile.
- 1864 John Taylor, junr., new roofing tile; used at South Kensington; BUILDER JOURNAL, 1864, xxii, 777-8. Bromhall Tile company patent roofing tile. Major's patent weather proof tiles.
- 1851 Ventilating roof tiles.
- 1870 Buff corrugated roofing tile.
- 1865 Bridgewater double roll tile (pantile) are 16½ ins. by 14 ins. each weighs 8 lb. 3 oz. Hammill Bridgewater roofing tile. White Italian roofing tile; B. J., xx, 636. C. D. Phillips, single grip and double grip tile. Patent weather proof tiles, Bridgewater. Count Portalis, ribbed. B. N. J., 1857, p. 251. Borie's cellular roofing tile. Brosley tile; any tracked should not be used. Ruabon tile. Staffordshire tile.
- 1887 Stone tile from Cornwall; used by Mr. Peto at Wetherly Gardens, Kensington; all outside joints pointed in cement.
- 1888 Foster, Wisbech; lock-wing roofing tile.
- 1880 Turner and Co., Hull; wedge lock roof tile. J. Robson, London; patent drip tile.

Couverture, in DALY, *Revue Générale*, 1855, xiii; 1861, xix. LANGLEY, *Builders' Prices*, 8vo., 1750, p. 15. BIRCH, *Pottery*, 8vo., 1858, i, 164. MOXON, *Mechanick Exercises* (Bricklayer), 4to., 1700, p. 2, 3, and 4. TURNER AND PARKER, *Domestic Arch.*, 8vo., 1851, xxvii-ix. FOWKE, *Report on Civil Construction*, Paris Exhibition, in CIVIL ENGINEER, ETC., *Journal*, 1857, xx, 111-14. AIKIN, *Illustrations of Arts and Manufactures* (Bricks and Tiles), 8vo., 1841; and *idem*, 1841, iv, 341-2. DOBSON, *Rud. Treatise on Bricks and Tiles*, 12mo., 1850.

MARBLE TILE. A slab of marble worked into the shape of a tile by the ancients for roofing temples, was the invention of Byzes of Naxos, who flourished 633-560 B.C.; PAUSANIAS, *Descr. Gr.*, v, 10. SILLIG, *Dict. of Artists of Antiq.*, 8vo., 1836. Portions of such a tile have been found at RHAMNUS; BASSÆ; ÆGINA; EPHEBUS about 4 ft. wide. WILKINS, *Prolusiones*, 4to., 1837, p. 15, 16; 21-26; 83-96. BUILDER JOURNAL, 1861, xix, 180. PAPWORTH, *Hypæthral Temples*, read at ROY. INST. OF BRIT. ARCHITECTS, 1865-66. ANTEPIXUM. HARMUS. IMBREX. LORICA. LUDON. SCUTULA.

Glass tile used in place of one or more tiles to admit light to a loft or garret. John Russell's patent, 1846; CIVIL ENGINEER, ETC., *Journal*, 1846, ix, 247. A paper tile is noticed s. v. Paper.

White tiles for lining walls for reflection of light; ROY. INST. OF BRIT. ARCHITECTS, 1864-65, p. 29, 35. MATHEMATICAL TILE. Hall's patent "hanging tiles" 1889 for tile facing on stand partitions, and facing on brickwork.

TILE CREASING or cresting; see PLAIN TILE; and COPING.

TILE IN CEMENT ROOF, or TERRACE ROOF; and plain tile flat; see **PLAIN TILE**. **CIVIL ENGINEER, ETC.,** *Journal*, 1838, i, 225; size 24 ft. by 12 ft. *On Iron Bars*, at Pompeii, 8vo., 1836, i, 200. **BUILDER** *Journal*, 1851, ix, 205; 1854, xii, 190; store 35 ft. by 12 ft. Gatti's Icewell, *idem*, 1863, xxi, 121. Comble couverte de tuiles assises à mortier de chaux et de ciment; **SAUVAL**, *Antiquités de Paris*, fol., Paris, 1724, ii, 280.

TILE LATH. Called *piend*, in Scotland and north of England. See **LATH**.

TILE PAVING. The Romans frequently used tiles (**BRICK**, p. 137) of ordinary clay for the channels of the **HYPOCAUST** to support the floor (**BRICK**, size of; p. 141). Tiles for ordinary use may be divided into four classes: i, plain black; ii, plain red; iii, plain white (with a yellow tinge); iv, flowered and patterned. White tiles are seldom, if ever, suitable for ecclesiastical purposes, except in churches of an Italian character, when black and white have a good effect, though much so for halls, schools, and domestic buildings. The first rule in arranging a pattern is to avoid a floorcloth-like appearance; they are likewise laid in diamond and other patterns. They are burnt in a flare kiln, and consequently have much of the texture of the red kiln bricks. They are made 6, 8, 10, and 12 ins. square. "Paving tiles for ground floors of offices, etc., are made of two sizes; the one called 'foot tiles', which when burnt hold $1\frac{1}{2}$ ins. square, and $1\frac{1}{4}$ in. thickness; the other called 'ten inch tiles', which when burnt hold $9\frac{1}{2}$ ins. square and one inch thickness"; **LANGLEY**, *London Prices*, 8vo., London, 1750, p. 22. Pavements of 10 inch tile, or 12 or foot tiles, are often used for the floors of wash-houses, dairies, etc. A 10 inch tile holding about $9\frac{1}{2}$ ins. square, 14 $\frac{1}{2}$ or say 15, will cover 1 sup. yard; and a 12 inch tile holding about $11\frac{1}{2}$ ins. square, 10 will cover that quantity. This pavement may be laid dry, but is usually well bedded in good mortar, made of fresh lime and brick dust or sand; two bushels of lime and one bushel of sand, will be required for each square of work. Encaustic tiles show an efflorescence; **NOTES AND QUERIES** *Journal*, 1865, 3rd ser., vii, 281, 332: and at times get dull; **BUILDER** *Journal*, 1857, xv, 179, 190, 212.

Among the varieties are:—Staffordshire goods, as blue, red, and buff terra metallic paving tiles, of various designs; vitrified stable pavings, grooved, of various sizes; and Peake's terra metallic tiles; made at Tunstall (*Jurors' Reports*, 1851). Metal-line tiles, 6 ins. by 1 inch thick; at Poole, Dorsetshire. Blue terra metallic paving and kerbing for footpaths, stable paving, etc., Hamblet, West Bromwich. Chertsey tile; **BUILDER** *Journal*, 1858, xvi, 502. **FLANDERS** or Holland tile for paving, 1449; **BRITTON**, *Dictionary*, 351. Also in 1727; **WEALE**, *Papers on Engineering*, 4to., 1843, iii. **DUTCH TILE**. **GALLEY TILE**. **FLEMISH TILE**. Compressed cement tile, made at Ghent; *cir.* 1870. **DRAIN TILE**. **PIPE**. **BRICK**, p. 131 and 138. **WALL TILE**. **TEYSE**.

Manufacture of tiles, in **ASSOCIATED SOCIETIES**, *Reports and Papers*; 1879, p. 26. **BUILDING NEWS** *Journal*, 1872, xxii, 511. **BUILDER** *Journal*, xv, 252. **AMÉ**, *Carrelages, etc.*, 4to., 1859. **CAHIER ET MARTIN**, *Carrelages*, 4to., 1868.

Wood and tile floors for picture galleries; **BUILDER** *Journal*, 1873, xxxi, 619. **BUILDING NEWS** *Journal*, 1873, xxiv, 742; 746.

TILES FOR PAVEMENTS AND WALLS (ORNAMENTAL). **BRONGNIART**, *Les Arts Céramiques—ou des poteries*, 8vo. and fol., Paris, 1854, 2nd edit., considers that in the ix century the Arabs habitually used a metallic glaze upon inlaid tiles; and **DE CAUMONT**, *Abécédair*, 1851, cites instances of the use of **ENAMELLED TILES** in 1076, but it was not until the xiii century that mediæval architects employed **ENCAUSTIC TILES** with the success they subsequently attained. He gives (p. 312-3) an illustration of the paving of the church of S. Pierre sur Dive; and the reputation of the Normans in this manufacture was so well known, that even at the present day, the encaustic tiles of the ancient cathedrals are occasionally termed "Norman". (Lord HENNIKER, *Norman Tiles*, 12mo., 1794.) This manufacture has been revived with great success since about 1830; and in many cases also varnished and coloured tiles have been used for wall

decoration, a good instance of which was at the palace of Madrid, in the Bois de Boulogne, by Bernard Palissy. (**FIGLINUM OPUS**.) Minton Tile works; **BUILDER** *Journal*, 1856, xiv, 400. G. Maw and Co., at Coalbrook dale, encaustic and majolica tiles; **BUILDING NEWS** *Journal*, 1867, xiv, 131; and imperishable tessellated pavements. Godwin's encaustic tiles; **BUILDER** *Journal*, 1860, xviii, Sept. 1, ads. p. x. Patterson of Manchester, 1880, marble mosaic tile. Bale's patent inlaid mosaic tile, and tessellated tile, at Poole, Dorsetshire. *Cost of tile pavements*, **BUILDER** *Journal*, 1859, xvii, 193. The working drawing for a tile $5\frac{1}{2}$ ins. by 8 ins. has to be made $6\frac{3}{4}$ ins. square to allow for shrinking.

In Western Europe at least, paving tiles do not seem to have been generally used until the xii or xiii century, though the Saracens and the Moors of Spain applied glazed tiles for that purpose, as well as for mural decoration at an earlier period. In England probably in the middle of the xii century—(examples at Castle Acre appear to be of the latter part of the xii, or of the beginning of the xiii century), as in the Chapter House, Westminster, in which many of the tiles bear figures of king, queen, priests, and knights, with armorial bearings and Early English foliage; also the pavement at Worcester, and tiles from Repton, Bakewell, Derby, Exeter, Malvern, Bredon, Great Bedwyn, Warlington, St. Cross, Tintern, Wirksworth, Tewkesbury, and many other places. In the two following centuries the decorations were of a more elaborate character; oak, ivy, vine, and other leaves were copied from nature, and skilfully displayed, and formed into elaborate patterns. Examples occur at Worcester, Wells, and Winchester cathedrals, at Shrewsbury, Evesham, St. Alban's, etc.; at Malvern the date 1453 occurs, with others at Stone and Malmesbury. In the xvi century encaustic tiles appear to have been superseded by the introduction of Flanders or gally tiles; these have their patterns depicted in superficial colours. Some occur at Holt; and many discovered at Wells in Norfolk, are given in **BRITISH ARCHITECT** *Journal*, Feb., p. 122, and March 1889. In Devonshire and other western counties tiles of a late period are occasionally met with, whose devices are raised above the general surface in relief; as at Tavistock, at Westleigh, and other places. Of the process observed in the manufacture of encaustic tiles, the red clay was prepared of the proper consistency, and placed in the hollow square mold, a stamp of wood bearing the device in relief was pressed upon its surface, and the pattern thus became indented into the clay. A thin layer of white clay was next laid into the hollow thus formed, and the tile was then baked—a yellow glaze being spread over the whole surface and burnt in. Instances occur of the pattern being left simply impressed without filling in, and then glazed over. The devices consist principally of foliage to form crosses, quatrefoils, scrolls, and other ornamentation; heraldic bearings, symbols, figures of mounted knights, kings, queens, and grotesque figures, beasts, and birds. In many cases the pattern is complete in itself on the single tile, but sets of four, nine, sixteen, and other numbers, with a continuous pattern extending over their whole surface, are not uncommon. Four or more tiles sometimes produce one complete shield, as at Westminster, Worcester, Gloucester, etc., and in others the shields are introduced with good effect, as part of the foliated or geometrical design of the pavement. At Worcester, the well-known bearings of Richard, king of the Romans—the lion rampant within a bordure bezanty, for the earldom of Cornwall, and the spread eagle—are each formed of four tiles, the shields being placed diagonally. At the same place are the arms of Beauchamp and bishop Carpenter, so arranged as to form, when quadrupled, some interesting devices. At Gloucester are excellent examples of shields formed of four or more tiles.

There are four distinct classes:—1. *Embossed*; occasionally found, as at Doddington church, which seem of a very early date, but they are more generally of the late Decorated or Early Perpendicular period, and represent conventional or natural foliage with great elegance; yet are still very rare. The manufacture seems to have still existed in the north of Devonshire

at the beginning of the XVIII cent., and with these many of the churches of that district are paved (some are engraved in *ARCHÆOLOGICAL JOURNAL*). 2. *Encaustic tiles*. These have a surface presenting a white or yellow pattern on a red, brown, or black ground. A few curious examples of the early Flamboyant period exist in Normandy. They are also found in Ireland and Wales, and are most common in England, especially in the southern and western counties: they are of all dates, and represent every possible variety of subject. The pavements formed of these tiles may be divided into two classes, viz., (A) "trellised" and (B) "grounded" pavements: the former (A) being known by the employment of narrow or strip tiles, being one-half or one-third the width of the common square tile, and green or black, and sometimes red in colour; occasionally having a yellow pattern on a red ground. This arrangement is usual in the Decorated period. The "grounded" (B) consists of squares of sixteen tiles, and a pattern on four tiles with twelve black or green tiles round it. The pavement of abbot Sebroke in Gloucester cathedral, is much richer. This arrangement was only adopted where a considerable clear space is to be paved, as usual in the Perpendicular period. 3. An *outline pattern* stamped on the tile, in some cases perhaps coloured; or a greater thickness of the varnish where the stamp has sunk the surface. These are mostly confined to the midland and eastern counties; and are more common in Ireland than either of those described. They usually represent geometric patterns formed of circles and straight lines. The Irish examples are quite different, and correspond more nearly to the English *encaustic* tile. 4. These form ornamental patterns, by being cut of different shapes, and fitted together; the general arrangement is in panels; in Fountains abbey; in Ely, originally in the passage to the Lady chapel but now placed in the south transept; in prior Crauden's chapel at Ely, and the most curious one (given in *COLLING, Gothic Ornaments*, ii, pl. 14); a fourth is stated to be in Yorkshire. A set of unique tiles was discovered at Chertsey, as described in *ARCHÆOLOGICAL INSTITUTE JOURNAL*, 1850, vi, 407; 1855, xii, 96, 199; and given in *SHAW, Tile Pavements*, 4to., 1852. Others exactly similar in design, bearing the ancient legend of Tristram and Isoult, and subjects from *Le Mort d'Arthur*, were found at Hales Owen Abbey and date 1277-98; it is supposed the Chertsey moulds were obtained and the tiles made at Hales Owen; *JOURNAL of the ARCHÆOLOGICAL ASSOCIATION*, 1873, xxix, 435; 437-440. 5. *Marble*, which has been employed lately with *encaustic* tiles, and with great success, as at Jesus College chapel, Cambridge. *Church*, in *ASSOCIATED SOCIETIES, Reports and Papers*, 8vo., 1850, i, 12, with plates.

TROCHET, Methode pour faire une infinité de dessins differens, avec des carreaux sur partis de deux couleurs par une ligne d'angulaire, ou observations du père D. Douai, 4to., Paris, 1722. *MAJOR* (lord HENNIKER), *History of Norman tiles, stained with Armorial Bearings*, plates, 8vo., 1744; 1794. Good classification and references in *WILDE, Catalogue*, 8vo., Dublin, 1857, p. 161. *HOTHAM, Ancient Irish Pavement Tiles*, 32 patterns from S. Patrick's cathedral, and Howth, Mellifont, and Newtown abbeys, 4to. *OLDHAM, Pavement Tiles of Ireland*, of three sorts, 4to., Dublin, 1842-3. H. H. KNIGHT, *Inlaid Tiles from Neath Abbey*, by E. Moxham, 8 pl., fol. *Encaustic Tiles*, 77 examples, 4to., 1844; 1854. Also *Facsimiles* from Westminster chapter-house, Malvern abbey, etc., 24 patterns, 4to., Camb., 1842. Also from Winchester cathedral, Westminster, etc., 24 patterns, 4to., Camb., 1842; 1845. Also from Leicester, Salisbury, York, Reading, Bitton, etc., 22 patterns, 4to., Camb., 1844; 1845. *NICHOLS, Examples of Encaustic Tiles*, 4to., 1842-45; *NICHOLS, Decorated Encaustic Tiles*, 95 pl., 1845; *CHURCH, Inlaid Tiles from Diocese of Oxford*, 24 pl., 4to., Oxford, 1845. Lord ALWYNE COMPTON, *Tile Pavements, especially that of Higham Ferrers*. *SHAW, Specimens of Tile Pavements, from existing authorities*, 47 pl., 4to., 1852; 1858. YORKSHIRE PHILOSOPHICAL SOCIETY, *Guide to*, 1874, York, p. 118. WAY, and J. G. NICHOLS, *On Decorated Tiles*, in *GENTLEMAN'S MAGAZINE*, May and July 1844. *Worcester Enc. Tile Manufacture*, by F. St. John G. Barr and Co., 77 examples, 4to., 1844. Z. COLBURN, *Encaustic Tiles by Machinery*, at Society of Arts, 1865; *BUILDER JOURNAL*, xxiii, 349. *BUILDING NEWS JOURNAL*, xii, 341, 365, 379. At Derby; *JEWITT, Reliquary*, 1862, iii, 92. MILDE, *Glass Paint, and Tiles at Lubeck*, fol., 1848. *Heraldic Decorations of Tile Paving at Worcester*, by *JEWITT*, in *ARCHÆOLOGICAL ASSOCIATION JOURNAL*, 1849, iv, 217. *On Encaustic Tiles*, *idem*, 1847, ii, 261. EXETER, *ARCHITECTURAL SOCIETY, Transactions*, iii; and iv, 79. VIOLLET-LE-DUC, *Dict. Rais.*, s. v. *Tuile*. *Use of Tiles*, *ECCLESIOLOGIST JOURNAL*, 1848, p. 81; *idem*, ix, 83. ASSOCIATED SOCIETIES, *Reports and Papers*, 1246, at Louth, 1873, p. 24. *Worcester Tiles*, 1887, p. 149, 155, Kiln, 158. Heyden red and white clay, *temp.* Richard II, p. 154. G. ROWE, *Encaustic Tiles*, 20 col. examples, in *idem*, 8vo., 1879. Kiln for church tiles at Malvern; *GENTLEMAN'S MAGAZINE*, ciii, pt. ii, 162.

TILE PIN. In fixing the tiles formerly, a piece of oak, somewhat triangular in section, about $2\frac{1}{4}$ or $2\frac{1}{2}$ ins. long, was inserted in a hole from the back of the tile, and so prepared dropped on to the moss on the lath; usually one pin to each tile. Zinc nailed on boarding is now done as best work in Berkshire; *TILING*.

TILER. The mechanic whose duty it is to lay the tiles of a roof. The bricklayer sometimes undertakes this work. His tools are the *lathing hammer*, with two gauge marks on it, one at 7 ins. the other at $7\frac{1}{2}$ ins., or according to the gauge the tiles are to be laid. The *lathing staff*, of iron, in the form of a cross, to stay the cross laths and clinch the nails. The *tiling trowel* wherewith to point or torch the heads on the underside of the tiles; it is longer and narrower than the brick trowel. The *bosse*, of wood with an iron hook to hang on the ladder, or on the laths, for holding the mortar and tiles. The *striker*, a piece of lath about ten inches long, for separating and taking away the superfluous mortar at the feet of the tiles, when laid in mortar. The *broom*, to sweep the tiles clean after the striking. He requires wrought-iron T-hooks and hip nails, hay or moss, oak pegs, or galvanized iron, zinc, or copper nails. *BRICKLAYER, STRIKER, SLATING*, p. 88a. *RIPPING. Tools*, in *ENCYC. DES ARTS ET METIERS*, fol., 1751, i, plates.

1. *TILIA*; the Lime tree and Linden tree. It is a native of North America (BASS or lime of Canada) and common to Europe. The wood is fine and close-smoothed in grain, and beautiful in the enduring colour of pale yellow, or almost straw or creamy white. It is used in sounding-boards, and linings of pianos, for which its little tendency to warp makes it valuable. The weight of the cubic foot when dry is 46 lbs. according to MORIN; and its tenacity is 23,500 lbs. according to BEVAN. It cuts equally well with or across the grain, hence it has been much used for carved work, as by G. Gibbon and others (*CARVING*). After a time it becomes reduced by worms to a mass of honeycomb fibre. W. G. Rogers in 1856 before repairing such work, saturated it with a strong solution of corrosive sublimate to destroy the insects, and strength was given by injecting vegetable gum and gelatine. *Useful Applications of the Lime Tree*, *PENNY MAGAZINE*, 1843, xii, 386. An avenue of lime trees, adopted in time of Louis XIV is noticed in *NOTES AND QUERIES JOURNAL*, 1864, 3rd ser., vi, 478. MICHAUX, *North American Sylva*, 8vo., Phil., 1817-19; new edit., 1850, ii. *HOLTZAPFEL, Woods*, 8vo., 1843.

14. 71. *TILING*, formerly written "tyling". Common tiling for roofs is of two kinds, PLANE TILE and PANTILE. The *plain tile* is flat, and used formerly to have two holes in the head, through which oak pegs or pins, or zinc, iron, or copper nails were driven, and then hung upon cloven oak laths nailed to the rafters; but lately Staffordshire tiles, $10\frac{1}{2}$ ins. \times $6\frac{1}{2}$ ins. \times $\frac{1}{2}$ in., are hung by two lips upon sawn deal laths $1\frac{1}{2}$ in. \times $\frac{3}{4}$ in. The tiles weigh about $22\frac{1}{2}$ cwt. per thousand, and constitute a very substantial covering. The under eaves formed with tiles 7 ins. \times $6\frac{1}{2}$ ins. \times $\frac{1}{2}$ in.; at gables, tile and half ($10\frac{1}{2}$ ins. \times $9\frac{1}{2}$ ins. \times $\frac{1}{2}$ in.) are used to break joints, in every alternate course. For

vertical surfaces, tiles are made as formerly with two holes in end and are nailed to laths or in the joints of brickwork as may be required. The usual gauge for roof-tiles is four inches, at this gauge 560 tiles (600) will cover 100 square feet. The valleys are formed with tiles made to a suitable pitch; and tiles of various kinds, both plain and ornamental, are used to cover the ridges. The *pantile* is a cheaper and lighter covering; each is curved on the surface, and hung upon laths as before described, but to a wider gauge; these are chiefly used for temporary erections, and ordinary farm buildings; they are generally of local manufacture. S. J. B. 1. 14.

There is much diversity of opinion as to the best method of laying tiles; whether bedded, or what material, hay, moss, or mortar, and in what way bedded; if torched or pointed inside, oak or fir pegs, galvanized iron, painted, zinc, or copper nails; the best tiling being said to be done as in Berkshire, with zinc nails on boarding, and not bedded. SALMON, *Vade Mecum*, 8vo., 1755, 3rd edit., p. 5, 17. ROMBERG, *Zimmerwerks baukunst*, 4to., Leipzig, 1846-50, pl. 45. LANGLEY, *London Prices*, 8vo., 1750, p. 310. RONDELLET, *Art de Bâtir*, fol., Paris, 1835, cont. by BLOUET, 1847-48, pl. 103, etc. DOBSON, *Rud. Treatise on Bricks and Tiles*, 12mo., 1850, p. 106. *Journal of the CLERKS OF WORKS ASSOCIATION*, Nov. and Dec. 1883, p. 115, 217; and March 1889, p. 177-8. *BUILDER Journal*, 1851, ix, 393; 1865, xxiii, 51, 141. NEVILL, *Roof Coverings*, in *ROYAL INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1885, p. 100.

TILLMAN (...), of Berne, built 1468 the lady chapel, and the charnelhouse (*beinhäus*) there in conjunction with Jacob Closs. 68.

TILLOTSON (JOHN), was employed 1671 during the erection of S. Paul's cathedral; ELMES, *Life of Wren*, 4to., 1823, p. 307. As "Tillison" he is mentioned in the dedication to LEYBOURN, *Platform for Purchasers*, 8vo., 1685, as clerk of the works and paymaster (succeeding L. Spencer) at S. Paul's; and is described as "clerk of the works, auditor to the dean and chapter of S. Paul's, and controller of the household of William Ford archbishop of Canterbury", in FISHER, *Tombs in S. Paul's*, 4to., 1684, p. 113.

TILTING FILLET; and feathered fillet. A bevelled slip of wood inserted under the slate lathing, or boarding, at the eaves of a roof; generally $\frac{3}{4}$ inch thicker than the slating laths on lower edge. Also put up under the slates at the rake of the gables, to throw off the rain from the wall. *BUILDING NEWS Journal*, 1877, xxxiii, 604; 1878, xxxiv, 28. ARRIS. BELL CAST. BREAK. CHANTLATE. DOUBLING. EAVES BOARD, CATCH, LATH, and POLE. SLATER. S. J. B.

TILT YARD, LIST, or place for tournaments and jousts. At Rosenberg castle, between Prague and Vienna, in Illyria, which was a fine work of the XVI and XVII centuries, had a *turnier platz* 153 or 123 paces long and 60 broad, with two stories of galleries built on arches, having the back wall painted with heroes, still perfect (1857). At Schloss Krummau, in one of the six courts is a tilt yard, still unaltered, and surrounded by galleries for spectators (28, South Germany). RIDINGER, *Remarques et plan d'un carrousel*, 4to., 1761, and 15 plates of tilting exercises. NOTES AND QUERIES *Journal*, 1864, 3rd ser., vi, 477, gives a list of tournaments in Germany from 930 to 1487. At Hitchin may still be seen an elliptic enclosure which formed the yard, a hedge now occupying the place of the barrier. ARCHITECTURAL ASSOCIATION, *Sketch Book* (?). At Bolsover castle is a space adjoining the riding-house, which was the tilt yard of William duke of Newcastle, temp. Charles I.

TIMBER (Lat. *materies* in VITRUVIUS. Fr. solid timber, *bois de brin*; sawn timber, *bois de sciage*; windfallen wood, *bois chablis*). Felled trees fit for constructive purposes, and usually squared for the market. These are used for beams, girders, piles, posts, sills, sleepers, supports, etc. When sawn up, it forms planks, deals, battens, stuff, etc. Timber-trees ought to be felled in *autumn*, and at any time of the winter season; because then the trees recover from the roots that strength and soundness which in the spring and summer was dilated into leaves and

fruits; the best time to fell timber was said of old to be in the wane of the *moon*, or four days after the new moon, or in the last quarter, because its moisture is then consumed. In the selection of fir timber great care is required. Porous grain, with spongy heart, should be avoided, so also should dead knots, as they indicate a decayed heart. The heart is considered by some to be weaker than the exterior parts. Strong red grain and bright colour appearing to rise on the surface, which opens bright red but not wholly, shows good quality. As a general rule the greater the thickness of the timber, the worse it is in quality. Square timber is often injured by laying in water for a year or two: on after exposure to the weather it rends at the heart. The straightest grain and the heaviest is the best, and the heaviest is generally the strongest; all cross-grained pieces are bad. The lower part of the tree gives the strongest timber. Yellow deals are the strongest. BARLOW'S theory is that the strength of timber varies as the cubes of the length. LEA, *Tables of Strength*, etc., 8vo., 1850. BARLOW, *Experiments on Transverse Strength*, 8vo., 1835. AITKIN, *Tables for Timber*, 8vo., 1838. SHEARING. 1.

The *soundest timber* is considered to be that which had the greatest quantity of resinous or oily matters in it. The heart wood, particularly of the fir tribe, was full of turpentine, whilst the sap wood was not so, and decayed soonest. Greenheart, Teak, and Pitch pine, all probably owed their durability to the large quantity of hydrocarbon, or oil, with which they were impregnated; in some of the Pines of Demerara it existed to such an extent that they were used as torch wood. The Fir trees which were tapped for the turpentine contained in them, were almost worthless as timber. The importance of oil as a preserving agent for wood is shown by the fact that whaling ships invariably last longer, and are less subject to decay than any other vessels. The staves of old tallow casks make a more lasting and durable fence than any other sort of wood, owing to the oil with which the wood has become saturated. Resinous timber withstands heat and moisture where other kinds will decay; this was known to the ancients, as PLINY states that the more odoriferous is the wood, the more durable it is. The resin secreted in its tissues renders it impermeable to water. SCHACHT, *Der Baum*, 8vo., Berlin, 1853, relates several instances of the durability of resinous timber: also BATES of Chicago, in a report on American ship-timber, using the red and white pines of Oregon; the yellow or long-leaved pine of Virginia and California; the hackmatack or American larch; red or Norway pine. Amber, a former fluid from the Conifere of the upper tertiary and secondary strata, is a proof of the unchangeability of resinous matters. *BUILDING NEWS Journal* (from the *Scientific American*), 1869, xvii, 168. ALBUMEN, ALBURNUM, ATMOSPHERIC INFLUENCE, BALK, BATTEN, BENDING TIMBER, BENT TIMBER, BOARD, CHAR, COLTIE, COMPASS, CREOSOTING, DECAY, DILATATION, DRUXEY, DRYING, DRY ROT, END, EXPANSION, HEART WOOD, HEARTY STUFF, HUNDRED OF DEALS, INCOMBUSTIBLE, JACK TIMBER, LOAD, LOG, LUMBER, MEDULLARY RAY, PAINT, PECKY, PLANK, PRESERVATION, ROT RUMMAGING, SAP, SCANTLING, SEASONING, SHAKE, SHRINKAGE, SPAR, SQUARING, STICK, STRING MEASURE, STRINGY, STUFF, TAR, TIMBER BRAND or MARK, WANey, WARP, WET ROT, WOOD, WOOD WORKING MACHINERY.

Timber is practically unchangeable in the direction of its length from the mere absorption of either heat or humidity, at the same time practically both inextensible and incompressible in that direction; *ENCYCLOPEDIA BRITANNICA*, art. Construction of Building, 8th edit. PARTINGTON, *Builder's Guide* (Carpentry), 8vo., 1825, p. 527, says in straight-grained woods the change in length is nearly insensible, hence they are sometimes used for pendulum rods. AMERICAN TIMBER, BALTIC TIMBER, CANADIAN TIMBER, CLAPBOARD, CROWN TIMBER, DANZIG TIMBER, DEAL, EASTLAND BOARD, MATCHBOARD, MEMEL, NORWEGIAN TIMBER, PETERSBURGH TIMBER, PINE TIMBER, PITCH PINE, QUEBEC TIMBER, RED DEAL, RIGA, RUSSIAN TIMBER, SHIP BUILDING, SPRUCE FIR, SWEDISH TIMBER, TASMANIAN TIMBER, WAINSCOT, WHITE DEAL, YELLOW DEAL. Also other timbers and woods under their names in this work.

EVELYN, *Sylva, or Forest Trees*, 4to., 1786; 1801; 1812; 1825. *Report on Timber and Timber Duties*, fol., London, 1835. W. RICHARDSON, *Practical Timber Merchant*; his *Timber Trades Price Book*, 1869; and his *Timber Merchant's Guide*, 12mo., 1875; 1877. LASLETT, *Timber and Timber Trees, Native and Foreign*, 8vo., 1875. LIBRARY OF ENTERTAINING KNOWLEDGE, *Timber Trees and Fruits*; *Descr. of them as used in the Arts and Domestic Economy*, 12mo., 1830. SILLOWAY, *Carpentry and Building Timber*, 4to., 1858. SIMMONDS, *Vegetable Products and Uses in Arts and Manufactures*, 8vo., 1854. BLAIKIE, *Planting, etc., of Forest Timber Trees*, 2nd edit., 1814. BLENKARN, *British Timber Trees; their rearing, etc.*, 8vo., 1859. NIKOL'SKY, *Dict. of Russian Forests, compiled in the department of Naval Timber*, 3 parts and vol. of plates, 8vo., St. Pet., 1843-45. EASSIE, *Wood and its Uses*, in *BUILDING NEWS Journal*, 1874, xxvi, 540. BRITTON, *On Timber*, in *BUILDING NEWS Journal*, 1866, xiii; also 1868. LINGARD, *Nature of Timber*, 8vo., 1842. *TIMBER TRADES JOURNAL* from 1883. *TIMBER; WOOD, ETC., a Weekly Journal*, fol., 1887. SEDDON, *Notes on Building Trades*, fol., 1877, 2nd edit. SCIENCE AND ART DEPARTMENT, *Notes on Building Construction*, 8vo., 1875-79. GAMBLE, *Manual of Indian Timbers*, 8vo., Calc., 1881. 1. 4. 11. 14. 19. 41. 51.

TIMBER BENDING; see *BENDING TIMBER*. *BENT TIMBER*.

TIMBER BORING WORM; see *INSECT*, white ant or TERMES. LYCORIS. LIMNORIA. TEREDO, or sea worm.

TIMBER BRIDGE. Besides the publications named s. v. BRIDGE, CARPENTRY, and VIADUCT, the following books will afford information on the systems of trussing and executed works: also BURN'S timber bridge; GROSS; GRUBENMANN; LATTICE BRIDGE; etc.

PITROU, *Recueil de differents projets d'architecture de Charpente—la construction des ponts*, fol., Paris, 1756. AUBRY, *Construction d'un pont de bois de 450 pieds d'ouverture*, 4to., Paris, 1790. ROMBERG, *Zimmerwerks-baukunst*, 4to., Leipzig, 1846-50, plates 158 to 164. MECHTEL, *Des trois ponts de bois les plus remarquables de la Suisse*, fol., Basle, 1803. ISHERWOOD, *Mechanical works of the Utica and Syracuse Railroad*, in HAIN'S work. POPE, *Bridge Architecture, etc., and of the pendent Lever Bridge*, 8vo., New York, 1811. STEVENSON, *Civil Engineering of North America*, 8vo., London, 1838. HASKOLL, *Assistant Engineer's Railway Guide*, 8vo., 1848. SHANAHAN, *Stone and Timber Bridges of modern construction*, fol. (1790). KRAFFT, *Charpente*, fol., Paris, 1819-22, pt. 3. ANNALES DE CONSTRUCTION, fol., Paris, 1857, iii, 10, etc. VIGNOLES, *On Timber Bridges of large size for Railways*, at BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Sept. 1840; in *CIVIL ENGINEER, ETC., Journal*, iii, 358, 422. Of Switzerland, in *BUILDER Journal*, 1849, vii, 392. Bavaria; WIEBEKING, 200 ft. and 286 ft. span; GENT'S MAG., vol. lxxx, 1810, 377. Fulham, GENT'S MAG., 1751, p. 296. Near Cooper Bridge, Yorkshire, over the Calder, 1840, by W. Bull, C.E., 150 ft. span, 8 ft. wide, 8 ft. sine, in *CIVIL ENGINEER, ETC., Journal*, iv, 69. Canada, 212 ft. span; *idem*, p. 158. Prag, proposed 600 ft. span; *idem*, 1844, vii, 84. American, by MOSSE, at INST. OF CIVIL ENGINEERS; *BUILDER Journal*, 1863, xxi, 191. Honduras, over river Belize; *idem*, 1860, xviii, 757. India, over the Sutlej, pl. 32; over the Jumna, pl. 86; JACQUEMONT, *Voyage des Indes*, 4to., Paris, 1835-44. *Paradenia*, over the Mahavillaganga, in Ceylon; 205 ft. span; *Papers of CORPS OF ROYAL ENGINEERS*, 1 ser., iii, 154. *Chepstow* (old), COXE, *Tour in Monmouthshire*, 4to., 1801, p. 358-9. *Malahide*, Estuary Viaduct, Drogheda Railway, in *BUILDER Journal*, 1843, i, 299.

TIMBER BRAND or scribe marks, on deals and timber. Very little reliable information appears to be generally obtainable upon the subject of timber. The trade is in the hands of a comparatively few large buyers and firms, who are extremely conservative upon all that relates to it; and architects have therefore to rely very much, if not solely upon the repute in which the shipments from certain ports happen to be held, when including it in his specifications, though in many cases

they may vary much in character, and those from other ports may be equally well adapted for his purposes. A knowledge of the marks on timber is of value to the clerk of the works whose duty it may be to select it. The brands on deals are perhaps most useful to the timber merchant or builder; the specification of a cargo is shown to the former and he knows from experience the general quality from each port or shipped by the brand; but a person must be a judge of timber, it being useless to have a knowledge of brands only. Formerly certain kinds and qualities of timber could be distinguished by the brands on the ends, but many of the best known of their time have disappeared from the markets altogether. A careful detailed description, with explanations, is given in *BUILDING NEWS Journal*, 1867, xiv, 503, 898-9; 1868, xv, 23 *et seq.*; with its intercommunication; and 1874, xxvi, 540. LAXTON, *Price Book* for 1881, p. 449. *Spon's Architect's and Builder's Pocket Book* for 1881, and later. *Journal of the CLERKS OF WORKS ASSOCIATION*, Feb. 1, 1884. W. RICHARDSON, *Timber Merchant's Guide, etc.*, 12mo., 1875. List of shipping marks on deals, battens, etc.; upwards of 2,000 marks, 8vo., 1886, in "*Timber Trades Journal*".

TIMBER BUILDING; FRAMING; HOUSE. "The earliest Doric buildings were naturally formed of the material more easily wrought, i.e., timber not stone, and hence the temple in stone was an imitation of a construction in wood, as all the details of Doric architecture tend to prove". LEAKE, *Travels in the Morea*, 8vo., 1830, iii, 268-89, who relates ancient works of timber at Mantinea, Olympia, Corinth, etc. Timber is the chief material in use among the Chinese. In Egypt, timber is rare, and is not therefore an element in the composition of the architecture of that country. Timber buildings in Kashmir, are noticed in FERGUSON, *Indian, etc., Architecture*, 8vo., 1876, p. 608, who, *History of Architecture*, 8vo., 1867, describes *Wooden types copied in stone*, i, 91, 204-7; ii, 302, 774. The Churches of Norway, i, 672-4; and of Russia, ii, 356. ATKINSON, *Art Tower*, 8vo., 1873, mentions one as "the oldest in the world". At Laval, in department Mayenne, there is one supposed 400 years old (50).

This article is intended to refer to buildings erected wholly of timber, but writers are so apt to use the word "timber" to works that are better known as HALF-TIMBER, dating from about 1300, that probably many of the references which follow should be properly placed under the previously named article. A few examples occur of "contracts" for such structures. In 1448, Thomas Sturgeon of Elsenham, Essex, carpenter, was bound in £100 to make "an howse within the said college as in werk of carpentrie", with all timber, to be 240 ft. with return and 20 ft. wide, for £100 for Queen's college, Cambridge; and for roof of the hall 50 ft. by 23 ft. for £80; WILLIS and CLARK, *Arch. Hist. — Cambridge*, 8vo., Camb., 1886, ii, 7-12. 1484, a timber house at Kirklington, Yorkshire; WHITAKER, *History of Richmondshire*, fol., 1823, ii, 146. 1533, Thomas Scotte of Hawkhurst, in his will of 8 May, provides funds "to build set up and finish my house which now lyeth in frame at Congehurst", TESTAMENTA VETUSTA, ii, 664. Some old church towers and spires in Essex are entirely of timber.

Publications are named s. v. ELIZABETHAN, ETC., ARCHITECTURE; among the later ones are: PHILIP, *Views in Lancashire and Cheshire of Old Houses and Castles*, 24 pl., fol., circ. 1820-24. RIMMER, *Ancient Halls of Lancashire*, 4to., 1852. ELWES and ROBINSON, *Castles, Mansions, and Manors of Western Sussex*, 4to., 1876. ROBINSON, *Mansions and Manors of Hereford* (1888?). BEDFORD LEMERE and Co., *Photographs of Half-timbered Houses*, No. 1501-40, 4to., 1877 circ. NIVEN, *Old Houses in Warwickshire*, fol., 1878; *Old Staffordshire Houses*, fol., 1882; and *Old Worcester-shire Houses*, fol. TAYLOR, *Old Halls of Lancashire and Cheshire*, 4to., 1884.

In England, by J. JUSTEN, in *BUILDER Journal*, 1863, xxi, 165, 185, 234. In England, by REPTON, in *BRITISH ARCHÆOLOGICAL ASSOCIATION Journal*, 1852, vii, 98-107. TURNER and PARKER, *Domestic Architecture*, 8vo., 1851-53, ii, 30; iii, 23; p. 181-2. BAILY, *Remarks on Timber Houses*, 4to., 1869;

reprinted in *BUILDING NEWS Journal*, 1870, xviii, 46 to 197.
 BRANDON, *Ancient Timber Framing*, in *BUILDER Journal*, 1858, xvi, 223; 259. *Timber Construction*, *idem*, 1857, xv, 637.

SEDDON, *Old German Timber-framed Houses*, *BUILDING NEWS Journal*, 1869, xvi, 36, 47, 63. *New Zealand, idem*, 1869, xvi, 57. *From Norway, idem*, 1873, xxiv, 9, 233: *idem*, 1874, xxvi, 172, 214, 524: *ARCHITECT Journal*, 1876, p. 127: and *BUILDER Journal*, 1883, xlv, 705 and two plates. *In America, idem*, 1865, xxiii, 581-2. *Sweden in XVI cent.*, DALY, *Revue Générale*, 1841, ii, 401. *Emigrants' Houses, idem*, 1840, i, 276. *India*, VIOLETT-LE-DUC, *Dict. Rais.*, s. v. *Maison*, 215.

DIJON. SWEDISH ARCHITECTURE. CHESTER. CHARTRES.
 COLMAR. NORWEGIAN ARCHITECTURE. YPRES. MALINES.
 LISIEUX, and others. CAGE HOUSE. JOINT. CROOK.

General publications:—BOTTICHER, *Die Holzarchitektur des mittel alter*, fol., 1837. FURTENBACH, *Architectura Recreationis*, fol., 1640. DAHL, *Denkmale, etc., Ancient Wood Buildings, Churches, in Norway*, 24 pl., fol., 1837. DALY, *Notice d'une maison Suédoise en bois*. HATFIELD, *American House Carpentry*, 8vo., 1845. GRAFFENRIES and STÜERLER, *Schweizerische Architektur (Bern)*, fol., 1844; 1847. EISENLOHR and FEDERLE, *Wood Buildings of Black Forest*, fol., 1853. DEGEN, *Const. Ornamentale en bois*, 48 pl., 4to., Paris; and Suppl., 36 pl., 1860-66. GLADBACH, *Schweizer Holzstyl*, fol., 1868. ROSENGARTEN, *Architektonischen stylarten*, 8vo., Bruns., 1857, p. 335-40. BURGESS, *Architectural Drawings*, XIII cent. work, fol., 1870. VIOLETT-LE-DUC, *Dict. Raisonné*, s. v. *Charpente*. ROMBERG, *Zimmerwerkes baukunst*, 4to., Leipzig, 1846-50, pl. 9, etc. WEINBRENNER in HOCHSTETTER, *Schweizerische Architektur*, Carls. SCHUBLER, *Seingraphia Artis Tignaria*, fol., Nur., 1736. RONDELET, *L'Art de Bâtir*, fol., Paris, 1812; and suppl. by BLOUET, fol., Paris, 1847-8. NEUFFORGE, *Architektur*, fol., Paris, 1757-76, viii. LE MUET, *Manière de bastir*, fol., Paris, 1623, translated by PRICKE, *Art of Pair Building*, fol., London, 1627. LANGLEY, *Ancient Masonry*, fol., 1736, pl. 374.

TIMBER DRYING; see DRYING. Parson's "new Drying system" is described in *BRITISH ARCHITECT*, May 1, 1885.

TIMBER FRAMING; see HALF-TIMBER HOUSE. TIMBER BUILDING. CARPENTRY. CAPES, *Timber Framing*, *BUILDING NEWS Journal*, 1853, iv, 1255-8, with diagrams.

TIMBER RAFT; see RAFT.

TIMBER, or WOODEN, STRUCTURE, or erection of a movable or temporary character. A license was necessary to be obtained from the late Metropolitan Board of Works, under the 13th section of 45 Victoria, cap. 14.

TIME and OVERTIME. DAY'S LABOUR; LABOUR. PIECE WORK.

TIMEGAD. The modern name of THAMUGAS, in Algeria.

TIMOCRATES; see DEMOCRATES.

TIN. The name of this metal is considered to denote its dark colour when in the crude state; but its Hebrew name does not show whether the tin obtained from the Eastern Archipelago, Spain, or Cornwall, is meant. When Julius Caesar landed B.C. 55 in Britain, tin was to be found in the Midland Counties. It was in common use about 2,800 years ago; it is unlikely we shall ever know who first brought it from Cornwall to Asia, and used it to harden copper. PLINY and others call it *plumbum album*. It is mentioned in *Numbers*, xxxi, 22; by HOMER, *Iliad*, ii, 25. CHILDREY, *Natural Rarities of England, etc.*, 8vo., 1660, p. 8, mentions the old timbers, nails, axes, and other utensils, found 50 fathoms deep. According to BERZELIUS, tin is found in England, Saxony, Bohemia, Hungary, the isle of Banca, the peninsula of Malacca, in Chili and Mexico. Malacca furnishes the purest tin, and Cornwall the largest quantity. It is now (1878) said to abound in Missouri. As the ore is found frequently near the surface, it is thought the ancients discovered it readily; it is easily reduced by charcoal and a moderate degree of heat to the state of metal. The *Philosophical Transactions*, *Abv.*, ii, 572, describes the method of obtaining and preparing this metal in Cornwall. The last process is to pass the metal through the more intense heat of the refining fire, where all the remaining

dross is skimmed off, the burning mass is poured into moulds holding exactly 320 lbs. weight, and being left to cool, it is in that state called "block tin". These blocks are stamped with the melter's house-mark, and sent to the nearest coin-marking town to be assayed and to receive the duchy seal, and each one hundredweight pays a duty of four shillings to the duke of Cornwall. The four ancient towns were Leskard, Lestwithiel, Truro, and Helston, and Penzance was added by Charles II. CAMDEN, *Britannia*, 1607, new edition by GOUGH, fol., 1789, p. 10. Tin occurs as the peroxide of tin, in veins and is called "tin-stone". When found in loose rounded masses, grains, or sand, in alluvial soil, it is called "stream tin". The former when reduced to the metallic state, yields "block tin"; while the latter yields "grain tin" which is the purer of the two. Adulteration and purity of tin, in ACKERMANN, *Repository of Arts*, 2nd ser., 1816, ii, 327. BLOCK TIN. PLANISHED TIN.

In 1352, 1 cwt. 2 qrs. 2 lbs. of tin cost 22 shillings per cwt., or £1 13s. 5d.; BRAYLEY and BRITTON, *Westminster Palace*, 8vo., 1336, p. 182. Tin is sold as English blocks; English bars (in barrels); English refined; Banca; and Straits. The ores are common; superior common, fine, superior fine; metal tin as common, refined common. *Alloys of tin*. Most of the malleable metals are rendered brittle by it. With potassium and sodium it gives a brilliant white alloy less fusible than tin. With arsenic it is whiter, harder, and more sonorous. With antimony it forms a white, hard, and sonorous alloy called PEWTER. With bismuth it becomes more fusible than either of the metals, hard and brittle. With copper it gives BELLMETAL and BRONZE. With mercury, the compound is used for silvering mirrors. With iron, white compounds are more or less fusible according to the quantity of iron; tin plate is most useful; and with pewter (as Britannia metal) are extensively applied in manufacture. Oxide of tin is puttee powder, *Jurors' Reports*, 1851, note 560. WILLIS and CLARK, *Cambridge*, 1886, i, 110; and *Tin and Type* for a louvre in 1603, ii, 493.

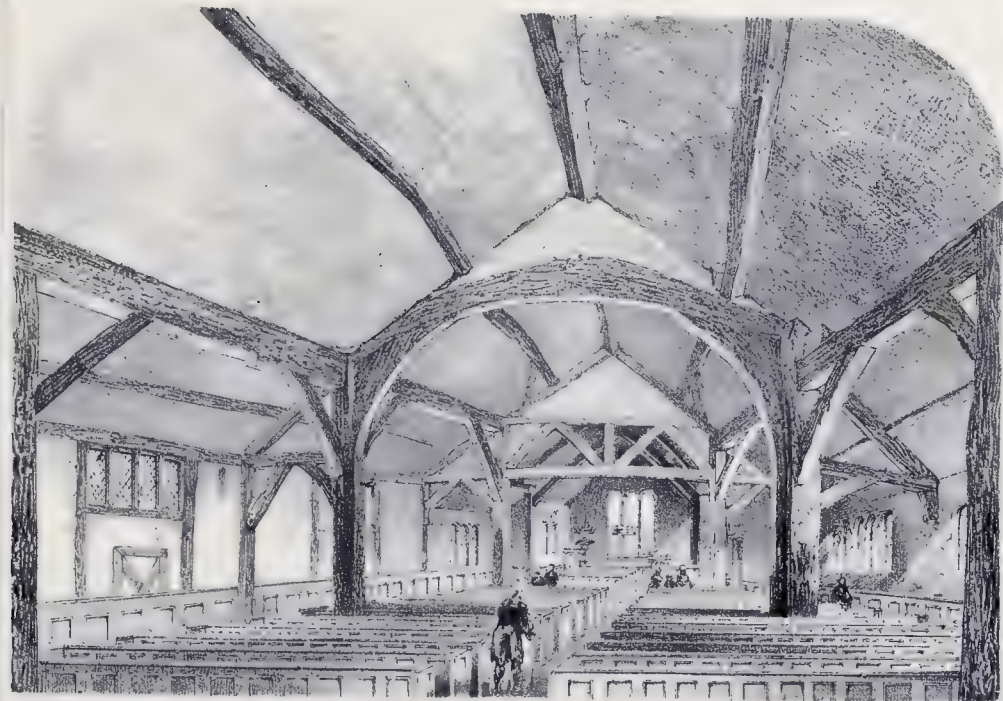
This metal is often used in building. At Bangkok, the roofs of the royal residence are covered with plates of tin. TINNED PLATE; and TINNED LEAD PIPE. "Tinning nails and instruments" is mentioned in 1368; FREEMASONS' MAGAZINE, 1862, vi, 405. DOG TIE. Tinned bars for plate locks, in 1604; CETHAM SOCIETY, *Shuttleworth Accounts*, 8vo., 1856, i, 156. "Wrest laches" of tinned iron, tinned iron rings, tin for making the joints in the lead pipes, tinned iron nails for the doors, are all named 1367-9 as required for Rochester castle; ARCHEOLOGIA CANTIANA, ii, p. 3. Pipes of "clene tin" are mentioned in *Piers Ploughman's Creed*, 4to., 1553, Glossary, line 387. In ACKERMANN, *Repository of Arts, etc.*, 8vo., 1819, vii, 2nd ser., 269, it is mentioned that "tin is one of the metals which experiences the least alteration from the air; the proofs of which are to be seen in the remains of old tapestry which were mostly prepared with leaves of tin varnished."

MAURICE, *Indign Antiquities*, 8vo., 1794, vi. *Blocks of Tin found in England*, *ARCHÆOLOGICAL JOURNAL*, 1855, ix, 281; xvi, 22; 1871, xxviii, 196. Sir H. JAMES, *Note on the Block of Tin dredged up in Falmouth Harbour*, 8vo., 1863. FLOWER, *History of the Trade in Tin, Tin Mining, etc., and process of making tin plates*, 8vo., 1880. Sir C. HAWKINS, *Tin Trade of the Ancients in Cornwall*, 8vo., 1811. PENNY MAGAZINE, 1835, p. 33, 55, 58. ECLECTIC REVIEW for 1855. INSTITUTION OF CIVIL ENGINEERS, *Tin and Copper Ores*, xvii, 195. *BUILDING NEWS Journal*, *Tin Beating*, 1858, iv, 203. URE, *Dict. of Arts, Manufactures, etc.*, 6th edit., 8vo., 1867. CHARLETON, *Tin, Mining and Smelting*, 8vo., 1884. SYMONS, *Tin Deposits of Tuscany*, 8vo. (1883). 14.

TINÆA; see TAENIA.

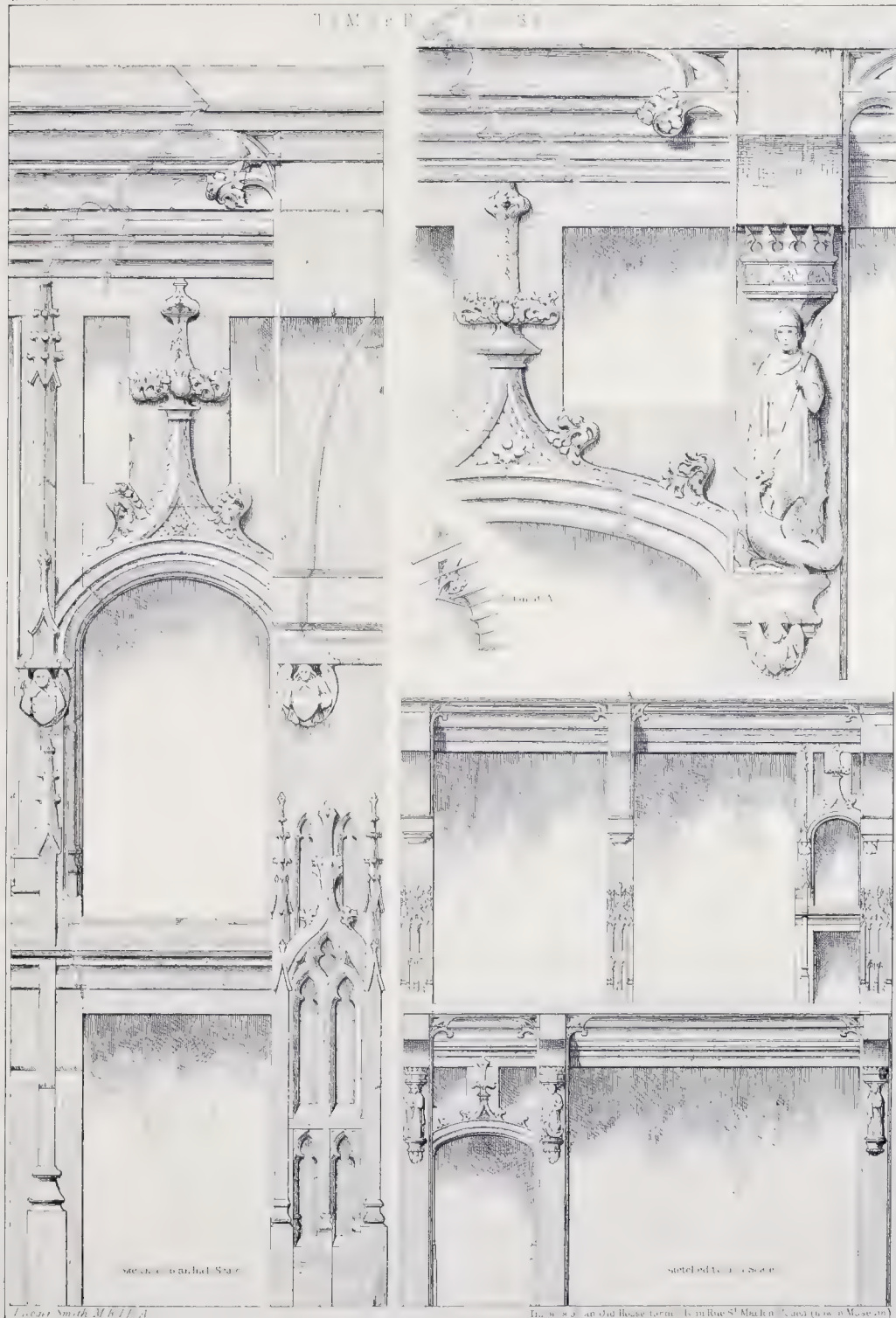
TINEH or TEENEH; see PELUSIUM.

TINFOIL. Tin is so malleable that it may be reduced into leaves 1-1000th of an inch thick; it is then called "tinfoil". It is a very useful material for keeping moisture from articles wrapped in it; and also for lining walls to prevent damp coming through; but the joints require to be well secured and lapped.





TEMPLES



Design Smith M.H.I. A.

Design of a choir and transept. In Rue St. Martin, Paris, (see in Museum)

Designs for the choir and transept. In Rue St. Martin, Paris, (see in Museum)





THE HOUSE OF COMMONS, LONDON.

1840



THE HOUSE OF COMMONS, LONDON.

1840

THE HOUSE OF COMMONS, LONDON.



The ornamental crystallisation on tinned surfaces carried out about 1817, led to the invention of a "patent metallic paper" by M. J. Brunel, in sheets 4 ft. by 20 ins., and is described with specimens, in ACKERMANN, *Repository of Arts, etc.*, 8vo., 1819, 2nd Ser., vii, 269. "Tinfoil decorative painting" was established about 1874; it could be applied to the room rapidly, and only required a coat of varnish; but other coats could be applied if desirable for wear.

TING. The Chinese term for a pavilion. *Detached Essay, CHINESE ARCHITECTURE* (p. 106).

TINGLE or TRINGLE, perhaps from "triangle". A strip of metal used to catch the lower edge of a pane of glass, a slate, etc., to keep it from slipping, when such work is being repaired. Also to guard against the wind getting under and disturbing flashings, one end being nailed to the boarding, or hooked on to the head of a slate, the other end being clipped over the lower edge of the flashing; 8 lb. lead is used for this purpose; SEDDON, *Building Construction*, 4to., Chatham, 1877, p. 85. LINE PIN.

TINKER. A mender of old brass; JOHNSON, *Diet.*, who derives the word from a tinkling noise being made while mending the goods: a "tinman" is a manufacturer of tin articles, or of iron tinned over. 1588, a tinker soldering gutters; CHETHAM SOCIETY, *Shuttleworth Accounts*, 8vo., 1856, i, 48.

TINNED IRON PLATE. Iron is coated with tin to protect it from rust or OXIDATION. If the tin be removed from the surface of the plate in places, and the plate be placed in dilute oil of vitriol, the iron will be dissolved out and the tin will be left; it only protects iron against the action of substances which affect iron but do not readily affect tin. Tinned iron is used for domestic articles, as saucepans. Tinned hardware is often open to objection, in that pure tin may not be used, but a mixture of lead and tin. The art of tinning plate-iron is supposed to have been invented either in Bohemia, or in Germany, near the tin mines of the Erzgebirge mountains, which were the most extensive in Europe after those of Cornwall. About 1665 an attempt was made to introduce the manufacture into England, by A. Yarranton, who went there for that purpose; PARKES, *Manufacture of tinned plate or tinned sheet-iron*, read at Lit. and Phil. Society of Manchester, *Memoirs*, 2nd ser., iii, 347-389. Tin plates are prepared and sold as IC charcoal, 1st quality; IX charcoal, 1st quality; IC charcoal, 2nd quality; IX charcoal, 2nd quality; IC coke; IX coke, all at per box; while Canada plates are sold at per ton. Brands or marks are explained in *Atchley's Price Book* for 1869, p. 234. The Tin plate workers' (alias wire workers') company of London was incorporated 10 Charles II, 1670. A "tin plate exhibition" was opened June 1878 at the Crystal Palace.

"The best covering for roofs is plates of iron tinned", as stated 1768 by MILAZIA, *Lives*, s. v. da Ponte, 8vo., 1826, ii, 125. Between 1720 and 1788 some works described "Latten" as iron tinned over. Such plates are described in WATSON, *Chemical Essays*, 4to. edit., 12mo., 1787-8; and HENRY, *Elements of Experimental Chemistry*, 8vo., 1818, ii, 130, describes the manufacture, and notices that iron plates previously cleaned by a dilute acid may be covered with tin by dipping them into that metal when melted. By Morewood's patent, plates 6 ft. by 2 ft. could be tinned. Tin for roofing purposes in North America expands and contracts and has a tendency to get out of order, but still is a good roofing material when properly put on; zinc there is worthless. Thick canvas is good for flat verandah roofs or small surfaces, being preferable to tin, inasmuch as it suffers less by alternations of temperature, reflects less heat, makes less noise in rainy weather, and takes less time to put on; VAUX, *Villas and Cottages*, 8vo., New York, 1857, p. 60. (QUEBEC.) A dome or cupola to the cathedral at Geneva, has been covered: it is used in Russia; GRANVILLE, *St. Peters.*, 8vo., 1835, ii, 183. KLAUSENBURG. A spire at Wolverton church, near Warwick, was of tin made at Birmingham before 1796; GREEN, *Worcester*, 8vo., 1764, p. 52. The spire of Yarmouth church, Norfolk, was rebuilt after 1803 when it and the ball were covered

ARCH. PUB. SOC.

with copper tinned; *Norfolk Tour*, 8vo., 1829, i, 265. A theatre at Boston, U.S.A., is described in CIVIL ENGINEER, etc., *Journal*, 1838, i, 390. Tin plate has lately been used for hot-water pipes.

There is great liability of tinned plate to rust rapidly as soon as some part of the tin covering gives way; probably none is of lasting value unless painted from time to time. On account of the nondurability of tin coating, a system was adopted in France of covering iron articles first with a coating of nickel; BUILDER *Journal*, 1861, xix, 420. The oxidation explained, *idem*, 1883, xlv, 154. GALVANIZED IRON. OXIDATION. ZINKED TINNED PROCESS; see PICKLING. SALMON, *Art du potier d'étain*, fol., 1788. PARKES, *Account of the several processes—Tin Plate*, 8vo., Manch., 1818. *Visit to Tin Plate Works*, BUILDER *Journal*, 1860, xviii, 2.

"Tinned plated sheet lead" was patented 1870 by Haines of Liverpool.

TINNED LEAD TUBE or pipe. The coating of a tin pipe by lead when the tube is drawn was apparently attempted in 1859 by Sébille of Nantes, to avert the supposed poisonous action of certain waters on lead pipes. In Manchester it was tried about 1848 but the metals were found to separate even during the first year; CIVIL ENGINEER, etc., *Journal*, 1859, xxii, 347; BUILDING NEWS *Journal*, 1859, v, 808; BUILDER *Journal*, 1861, xix, 743; 1862, xx, 732. Bennett's method of tinning lead pipes is explained in BUILDING NEWS *Journal*, 1863, x, 81, and said to cost little more than lead pipe. The manufacture was introduced in 1867 in New York. "Haines' patent" lead encased block tin pipe, an improved medium for the supply of pure water, was explained B. N. J., 1869, xvii, 353; ARCHITECT *Journal*, 1870, Aug. 27, p. 107. It has been stated that such pipes have been written against, as tin is often more readily attacked, and dissolved, by water than is lead, and if placed in association with lead, if by a flaw the water has contact with both metals they are dissolved with increased rapidity. Galvanised iron pipe is just as dangerous, for then salts of zinc are formed and gradually dissolved; BUILDING NEWS *Journal*, 1871, xx, 21, 38, 99, 209; 235; denied 308. The BUILDER *Journal*, Nov. 4, 1871, notices a specimen of tinned lead pipe under Hamon's patent, produced by Lane and Nesham, successors to Burr brothers, of Lambeth; and stating that Mr. Alderson tried to produce them in 1804, and Mr. Burr nearly succeeded in 1836. Some care is of course required in soldering such pipes. Iron or lead pipe lined with tubes of glass made a fraction smaller than the metal one and the space between filled in with plaster-of-Paris; a company was organised at New York 1872.

TINNEVELLY. The capital of the district of the same name, in the presidency of Madras, in Hindostan. The temple was built on one plan and at one time, and is a double temple, one half being dedicated to Siva, the other to his consort Parvati. The whole enclosure is 508 ft. by 756 ft. long, each side having two gopuras or gateways, and one in the dividing wall. On the left of the left-hand enclosure is a hall of 1,000 pillars, 100 in length and 10 in width, fine porches, while the inner enclosure is preceded by another gopura. FERGUSSON, *Indian, etc., Architecture*, 8vo., 1876, p. 367; and his *History of Architecture*, 8vo., 1867, ii, 570-7. HUNTER, *Imp. Gazetteer of India*, 8vo., 1881. CALDWELL, *History of the District of T.*, 8vo., Madras, 1881.

TINO DI CAMAINO. A sculptor and architect of Siena, was a distinguished pupil of Giovanni Pisano. He built the chapel wherein are deposited the remains of S. Ranieri, in the duomo at Pisa, richly decorated with marbles; also the font in the cathedral, inscribing his name in the ornaments; and another chapel in the baptistry of the church of S. Giovanni (or, another chapel in the bapt. of S. Giovanni at the duomo?); VASARI, *Vite*, edit. Flor., 1846; edit. London, 1850, i, 76, calls him "Lino". 30. 32. 33. 59. 73.

TINOS. An island in the Grecian Archipelago. The mountains furnish fine marble of various colours. Since 1820 a

cathedral to the Virgin, with courts and gardens, is of Parian marble, it has a crypt; view in *ILLUSTRATED LONDON NEWS*, 1851, xviii, 610. *LITERARY GAZETTE Journal*, 1853, January, p. 22; 46. 28. 50.

TIN SAW. A saw used by bricklayers for cutting bricks for forming the soffit lines about one-eighth of an inch deep; also in direction of the tapering lines, and the false joints of headers and stretchers. 1.

TINSLEY (WILLIAM), of Cincinnati, U.S.A. He emigrated to America 1851 from Clonmel, Ireland, where he had been diocesan architect. He designed the State university at Bloomington, Indiana; the North Western university, Indianapolis; the college buildings at Gambier, Ohio; the asylum for the blind at Columbus; and other edifices. He was the oldest architect in the States at the time of his death (before 17) July 1885, aged eighty-one, at Cincinnati.

TIN-SMITH. The artisan working the metal. **TIN.** **TIN PLATE.** **CRANE.** *The Sheet Metal Worker's Guide*, 8vo., 1883. Stamping machinery enables this artisan to produce seamless covers and boxes at one blow. It was "introduced" from New York about 1886, though it had been in use in Birmingham some twenty years before.

TINT, formerly written "teint", *i.e.*, hue. Virgin tint or primary colour. **HALF TINT.** **TOPE.**

TIN WHITE. It resembles zinc white in many respects, but dries badly, and has even less body and colour in oil, though superior to it in water. It is the basis of the best white in enamel painting.

TIODA, THIODA, and Fioda. He appears as witness to the act of donation 16 November 802, by Alonso II the chaste, to the church of S. Salvador (now the cathedral rebuilt 1388), at Oviedo. As the subscription may be translated, "Fioda the master who built the church of S. Salvador", he has been further credited by CEAN BERNUDEZ with the chapels, between which it stood, which were built about the same time, and called the church of Sta. Maria (rebuilt 1705-12 as the capilla del rey Casto) and the church of S. Miguel or the Sta. Camara, the second oldest Christian building after the Moorish invasion in Spain, according to FORD, *Handbook*, 12mo., 1850, who besides following MORALES, *Viaje Santo*, xvii, 7, in considering that the church of S. Miguel de Lino, a short distance to the north of Oviedo, was by Tioda, adds the church of S. Julian (Santullano) to the north-east of that city; but does not seem to adopt the opinion of MORALES that Fioda was alive in 848, and was the architect of the church of Sta. Maria de Naranco, built in the time of Ramiro I, also a short distance from Oviedo. Alonso, who died 842, also built the church of S. Tirso (which is near La Corte) of which a tower remains, and near the palace that he had already erected he built the church of S. Julian. LLAGUNO naturally ascribes this church of S. Tirso and La Corte to this Fioda as he is called by CARBALLO, *Antigüedades de Asturias*; but Troda by MADOZ. CAVEDA, *Ensayo histórico*, 4to., Madrid, 1848, p. 88-9. 3. 28. 66. 68.

TIPASA. See **TEBESSA**, in Algeria.

TIRALI (ANDREA), of Venice. He designed 1690 the cappella di S. Domenico in S. Giovanni e Paolo; 1708 the tomb to the doge B. Valieri in the same church; 1700 the façade of the church S. Vitale; the good loggia and alterations to façade to the church of S. Nicola de' Tolentini after the death 1616 of V. Scamozzi: and some smaller works. He died 1737 aged 80, in Mouselice. CICOGNARA, *Venezia*, fol., Ven., 1838-40, ii, pl. 203. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 434-6, 438. FUESSL mentions *Pianta della Piazza di S. Marco*, 21 pl., fol., as by him. 68.

TIRAUNT. A tie-rod or bar, or stay-bar. "Tirant or closer", or tie in a penthouse roof; PRICKE, *Art of Fair Building*, fol., 1670, p. 31, translated from LE MUET's work. BRITTON, *Westminster Palace*, 8vo., 1836, p. 157, 159. 16.

TIRIOT or **TIRIEAU** and **Tirol (JEAN)**, 1622-42, master-mason-architect to Louis XIII, assisted J. le Mercier 1631 in the new fortifications and works of the canal in connection with the

Seine: and 1627 with C. Metezeau proposed the dyke at the siege of Rochelle. JAL, *Diet. Crit. de Biog. et d'Hist.*, 8vo., Paris, 1867, p. 1185.

TIRUVALUR. A temple situated about 30 miles west of Madras. It was commenced as a small village temple, of a double shrine dedicated to Siva and his consort standing in a cloistered court 192 ft. by 156 ft. over all, with one gopura in front. Being sacred or rich, it became surrounded by an outer court 470 ft. square, with two higher gopuras and numerous shrines and porches. Subsequent additions around it were made by a court 940 ft. by 701 ft. with five gopuras, some higher. In this last was built a hall or choultry of which 688 pillars only have been erected. "The whole as an architectural design—is detestable." RAM RAZ, *Hindu Architecture*, 4to., 1834, pl. 47-8, view and plan. FERGUSON, *Indian, etc., Arch.*, 8vo., 1876, p. 346-7; and *History of Architecture*, 8vo., 1867, ii, 575, plan and view.

TIRYNS. A site, south-west of Argos, in the Morea, and near the shore of the gulf of Nauplia, presenting the most ancient specimens of fortification, called Cyclopean. The citadel and its wall; the upper citadel, its palace, gate, propylæum, front court, men's court, bath-room, women's court, hall or vestibule, *thalamoi* in north-east corner, outer court, roof and upper story; terra-cottas and paintings; are all described in SCHLIEHMANN, *Tiryns; prehistoric palace of the Kings*, 8vo., London, 1886, the result of the latest excavations. GELL, *Argolis, or Itinerary of Greece*, 4to., 1810, p. 56. STUART, *Athens*, fol., 1830, iv, 28: Lord Elgin's drawings in the British Museum. **LIB. OF ENTERT. KNOWLEDGE, Pompeii, 8vo., 1831, i, 547-9. DODWELL, *Cyclopaean Remains*, fol., 1834; and *Tour through Greece*, 4to., 1819, i, 241. BLOUET, *Morée*, fol., Paris, 1836, ii, pl. 72. GAILHABAUD, *Monuments*, 4to., Paris, 1842-52, i. COMPANION TO ALMANACK, 1885, p. 158. PENROSE, *Letter to Roy. Inst. Brit. Architects*, Oct. 1887. 14. 23.**

TISBURY STONE. In 1860 lord Arundell reopened the ancient quarries of Wardour, in Wiltshire. The stone is of a warm colour, and a very fine grain (some of the beds being as fine as Caen stone), and possesses a sharp grit, the cost of working it being rather in excess of Bath stone, but scarcely more than half that of the Portland, or Yorkshire, stones. The beds vary from 18 ins. to 6 ft. in depth. The old castle of Wardour (partially destroyed during the Civil Wars), although many centuries old, presents no visible sign of decay; many portions of the work, such as fluted columns, architraves, cornices, etc., still preserving their original face and arris. The residence of lord Arundell, built about 1760, is another fine specimen of the durability of this stone, which has for centuries been extensively used in various parts of Wiltshire and its neighbourhood. Other buildings are, Old Wardour castle, the present Wardour castle, Tisbury church, Fonthill abbey (the seat of the late Mr. Beckford, where also a mansion was about 1854 erected by Mr. Kelk for the marquis of Westminster); and most of the seats of the noblemen and gentlemen in the vicinity; SMITH, at R.I.B.A. *Builder Journal*, 1851, ix, 747; 748. 1858, xvi, 548. *BUILDING NEWS Journal*, vi, 847; 1869, 335, 363. A new hall, etc., at Balliol college, Oxford, 1873-76 of Tisbury and Bath stones, by A. Waterhouse. The Teffont quarries, near Tisbury, supplied the greater part of the stone for Salisbury cathedral. It is a limestone of the Purbeck formation. BRITTON, *Beauties of Wilts*, 8vo., 1801-25, iii, 331. CHILMARK STONE.

TISDRA; see **THYSDRUM**, in Tunis.

TITAN. See **TELAMONES**.

TITE (sir WILLIAM), born ... February 1798, in the parish of S. Bartholomew the great, London. He became a pupil of D. Laing, and assisted him 1817-20 in the rebuilding of the body of the church of S. Dunstan-in-the-east, and in compiling its history, published 1818. After being unsuccessful in several competitions, he obtained 1827-8 the Scotch church, Regent square (DAVY, *Architectural Precedents*, 8vo., 1847); designed 1832 the Golden Cross inn, West Strand; and in 1837-8, with C. R.

Cockerell, R.A., he designed the London and Westminster bank, Lothbury. Competed 1840 for the Royal Exchange, and subsequently was placed with five others to again compete; ultimately the commission was given to him and the edifice erected 1841-44 (SURVEYOR, ENGINEER, ETC., *Journal*, i, 145); Mr. Trotman was associated with him in some degree. He designed 1838 the chapels, etc., of the Norwood cemetery (SURVEYOR, ETC., i, 170); also the original Nine Elms station, or Vauxhall terminus of the South Western railway (SURVEYOR, ETC., i, 52), 1849 that at Chiswick, 1850 at Windsor for the queen; and 1853-4 the Waterloo road; and at Southampton. 1840 the terminus at Blackwall of the London and Blackwall railway. The termini and most of the stations (1847-8 at Edinburgh) on the Caledonian and Scottish Central railways. 1847-8 the citadel railway station at Carlisle (COMPANION TO THE ALMANACK, 1849, p. 247). The stations on the line from Havre to Paris. The London station of the Woking Cemetery company, and planned the cemetery. 1854-56 Gresham house, Old Broad street, with E. N. Clifton, on the site of the old Excise office. The stations on the Yeovil and Exeter railway. 1857 messrs. Tapling and Co.'s warehouse, Gresham street; and 1858-9 Memorial church (Byzantine) at Gerrard's Cross, Buckinghamshire (BUILDER *Journal*, 1859, xvii, 588, 616).

Sir W. Tite was largely employed in the valuation, purchase, and sale of land for railways and improvements. Prof. T. H. Lewis was with him for two years; also his nephew Arthur J. Green (died 1855); while in his office were E. Trotman (died 1865); Arthur Baker; Charles Baily, elected 1865 into the office of the corporation of the city (died 1878); J. H. Steinmetz; and F. Bedford (died about 1857). He was elected Nov. 1838 president of the Architectural Society, which preceded the Royal Institute of British Architects, and merged into the latter body in 1842; of the Institute he was president 1861-63 and 1867-70; and received 1856 the royal gold medal; he was knighted in 1869, besides having been M.P., C.B., F.R.S., F.S.A.; honorary secretary from 1824 to 1869 of the London Institution, Finsbury circus; 1862 master of a city company; and 1866 president of the Camden Society. He read many papers at the Institute; and 1863 described the remains discovered at Chester (BUILDER *Journal*, 1860, xxiii, 109, 157). A portrait when a young man, by Renton, is at the London Institution, where is also a bust 1870 by W. Theed; a copy of it, and also a portrait painted by J. P. Knight, R.A., are at the Institute. He died 20 April 1873, at Torquay, aged 75, and was buried in Norwood cemetery. ROY. INST. OF BRIT. ARCHITECTS, 1872-73, p. 209-11. BUILDER *Journal*, 1873, xxxi, 337-9, 371.

TITICACA. The largest island in the lake of the same name in Bolivia. It contains many ruins, and is celebrated in the history of Peru as the spot where Manco Capac first appeared. ULLOA, *Voyage to S. America*, 8vo., 1772, ii, 163. TSCHUDI by ROSS, *Travels in Peru*, 8vo., 1847, pl. 45. SQUIER, *Incidents*, 8vo., 1877, p. 317, 359. TIAHUANUCO is on the lake.

TITO (SANTO DI), also a painter, born 1538 at Borgo San Sepolcro, in Tuscany. He designed an octagonal villa at Peretola for the Spini family; was employed at Casciano by the Corsini family; and at Monte Oliveto by the Strozzi family. At Florence, he made a staircase in the Strozzi palace to the disgust of Buontalenti; the casa di Baci in via delle Scuole, his own house with the doorway awry and curiously contrived (diminishing in height, MILIZIA); casa Fenzi, via Larga (FANTOZZI, *Guida*, 8vo., Flor., 1842); and the palazzo Dardinelli of three floors, badly arranged and designed (RUGGIERI, *Studio d'Arch. Civile*, fol., Flor., 1755, iii, 59-62). At Fiesole, the villa di Doccia from a design by M. A. Buonarroti. A Ciampolli was a pupil. He died 1603 at Florence, of which city he was admitted to the freedom; and left a son Tiberio, also a painter.

3. 5. 12. 14. 30. 68.

TIVER, or Spanish brown, is red ochre.

TIVOLI. The ancient Tibur. A town near Rome in

Central Italy, placed on a steep hill rising from the river Tevere or Aniene; the two parallel tunnels were carried out 1834 by the engineer Folchi to divert the river (CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 38). DODWELL, *Cyclopaean Remains*, fol., 1834, gives plates of the walls at villa of Cassius, at Colonocelli, and at Vitriano, on via di Casciano. The temple to Vesta, erroneously called Tiburtine Sybil (date unknown), is a peripteral building 21 ft. 6 in. diameter of which ten columns of stuccoed travertine of a Composite order remain; since x cent. it was the church of Sta. Maria Rotonda. A temple to the Tiburtine Sybil, an oblong structure of travertine, having a portico of four Ionic columns, was used as a church of S. George, but restored 1885. Several bridges, tombs, etc., were discovered after the inundation of 1826. The temple of Vesta is given in ISABELLE, *Edifices Circulaires*, fol., Paris, 1843. GAILHARDAUD, *Monumens*, 4to., Paris, 1858, i. MAUCH, *Arch. Ordningen*, etc., 7th edit., 4to., Berlin, 1875. CHABAT, *Fragments d'Arch.*, 4to., Paris, 1877, pl. 23-5. The Tivoli cap modified was used by sir J. Soane, at the Bank of England: it is remarkable as cut into the bell and not appliqué as usual: the leaf resembles that used at S. Remy; DALY, *Revue Générale*, 1841, ii, 227. DONALDSON, *Ancient Doorways*, 4to., 1833, gives the doorway.

The so-called villa of Maecenas (which name dates from the time of the architect Pirro Ligorio); from excavations it is considered to have been the ruins of the temple of Hercules Victor, in whose portico Augustus administered justice; it comprised a square atrium with Doric portico all round and the temple on a raised space in the middle. The tempio della Tusse is circular with a dome and central eye (which greatly resembles the tomb of S. Helena, the Tor pignattara); it is presumed to have been a tomb of L. A. Tuscus, or was a nymphaeum to his villa. There were many Roman villas; that of Cassius was explored in 1774 by de Angelis, and the many fine works recovered are in the Vatican.

Tivoli is the see of a bishop; the cathedral dedicated to S. Lorenzo was built 1635; it is considered to occupy the site of temple of Hercules mentioned by JUVENAL; the campanile of four stories is a good mediæval work. The church of S. Pietro, v century, on the ruins of the villa of Metellus Scipio, has ten columns of cipollino and some opus Alexandrinum pavement. The church of S. Maria Maggiore is of the same date. The other churches are: S. Andrea, vi cent. on the temple of Diana; S. Vincenzo; S. Biagio; and S. Giovanni Evangelista, with the Gesu. The villa d'Este was built for Ippolito d'Este, cardinal of Ferrara, and some works of decoration done 1549-68 by Pirro Ligorio; the casino has fine frescoes; later it belonged to a duke of Modena. The villa Braschi is built over the aqueduct of the Anio Novus, the aqueducts of the Anio Vetus and Aqua Marcia being at a lower level: the *specus* is 4 ft. wide by 9 ft. high. The castle erected by pope Pius II (1458-64) has an enclosure and five circular towers. LIGORIO, *Libro di M. P. L.; delle Antiq.*, 8vo., 1553. PALLADIO, *Architettura*, fol., Ven., 1570. SERLIO, *Architettura*, fol., Venice, 1663, gives 107-8 and 114-5 both temples. SADELER, *Antichità*, fol., Rome, 1660. PIRANESI, *Antichità Romane*, etc., fol., 1748. SOUFFLOT is said to have published views about 1750. LIGORIO ED CONTINI, *Villa Tiburtina di Adriano*, fol., Rome, 1751. CABRAL ET DEL RE, *Delle ville*, etc., 8vo., Rome, 1779. VALADIER, *Insigni fabbriche di Roma Antica e sul adiacenza*, fol., Rome, 1810-26. UGGERI, *Giornate Pittoriche*. MARQUEZ, *Illustr. dell'ville di Meenadi di Tivoli*, fol., Rome, 1812. GMELIN, *Tivoli e Albano*, fol., 1816. A work by SEBASTIANI is referred to. NICOLAI, *Costruzione della nuova Chiesa dell' Aniene in Tivoli*, Rome, 1829. MASSIMI, *Inolcazione del fiume Aniene*, 4to., Rome, 1838. VENTURINI, *Fontane del giardino Estense*, 4to., Rome, n. d. REZZONICO, *Monumenti Antichi*, 8vo., Rome, 1779. FOLCHI, *Ragionamento sulle scoperte fatte in T.*, 4to., Rome, 1834. TRAVERTINE.

14. 23. 28. 50. 96.

TIZIA, or Tigia; see THYSDRUS, in Tunis.

TLASCALA, or Angelopolis; see PUEBLA DE LOS ANGELOS. 96.

TLEMÇEN, a city in North Africa, the Pomaria of the Romans. It was entirely ruined by the Vandals; in A.D. 790, the site was obtained from the Berbers, and called Aghadir, and the mosque begun; when conquered 1080 by the Almoravides, a town under the name of Tagrart began to rise to the west of Aghadir, and both received the name of Tlemçen. The Almoahides erected a new wall 1161 including both towns. In 1248 it was taken and became the capital of a kingdom now included in Oran and Algiers, and was then not less illustrious than Granada in Spain. In 1553 it was taken by the Turks and declined. In 1839 it was the capital of Abd el Kader's dominions: and in 1842 it was occupied by the French. It possesses many religious edifices, which if smaller than the Alhambra are no less beautiful, with some details unequalled in Spain. The chief mosque, Djamaâ el Kebir, 1136, has 72 columns, all except two are square; part of the pavement and the fountain is of Algerian onyx. The mosque of Sidi Ahmed bel Hassan el Ghomari, now an Arab school, 1296-7, has the greater part of the beautiful Arab decoration remaining. Also the mosque of Sidi Abraham; the minaret of the mosque of the meclhour or citadel; the many relics stowed away in the lower rooms of the mairie, among which is the standard cubit measure of the Kissaria, of marble, and dated March 1328; it equals 47 centimètres or 18½ inches; and the tombstone of Bou Abdulla, the last king of Granada. The church is a good one for Algeria; the font is of green serpentine. Outside the town is the mosque of Abou Abdulla esh Shoudi, or Sidi el Halawi, dated 1353 with its decorated minaret, and eight columns of Algerian onyx with Moorish capitals, and richly carved ceilings of cedar. Of the great mosque of the Aghadir all that remains is the minaret, the lower part of which is constructed of large hewn stones of ancient Pomaria; upper portions of brick, perhaps later than 789. The cemetery near it has an octagonal tomb of Sidi Yakoub, a marabout, of much elegance. Sidi Bou Medin, the home of religion and science, in the best days of Tlemçen, should be seen: the great Arab cemetery has several good *Koubbas*. The ruined palace of Abou el Hassan Ali, the founder of all these noble structures, who reigned 1337-48, is one of his many palaces and richly decorated; its arcaded terrace was cleared of rubbish in 1881 by Collignon, conservateur des mon. historiques. The *Koubba* of Sidi Bou Medin, the patron saint of Tlemçen, born 1126 at Seville and died aged 74. The mosque itself is in the very highest style of Moorish art, of glazed tiles probably from Fez, and from Spain; a portico with a roof of honeycombed pendentives, its large double doors of bronze leading into the court, having a geometric interlaced pattern of great art. The mosque has five naves, the roofs are elongated vaults with plaster geometric patterns; the pillars are square; the whole building is covered with most delicate lace-like work. The medressa or college, is the same form as the mosque, and has an inner chamber with a fine domed roof of open wood-work, and fine tile mosaics at the entrance.

La M'dersa Tachfinya palais, of XIV century, in four plates; and the mosque of Sidi Ibrahim, of XVI century, are given by DANJOY, in the *Archives de la Commission des Monuments Historiques*, fol., 1856-72.

TLOS, in Lycia. Little more is known of this once important city but that it lay on the road to Cibyra. It was first accurately determined by FELLOWS, *Asia Minor*, 8vo., 1839, p. 237, 2nd edit., 1852; and *Lycia*, 8vo., 1847, p. 132, who considered the original city must have been demolished in very early times, as "finely wrought fragments are now seen built into the strong walls which have fortified the town raised upon its ruins." The theatre was large and the most highly finished he had seen, for the seats were not only of polished marble, but each seat had an overhanging cornice often supported by lions' paws. The tomb is always called "heroum". The church is a square with a semicircle on each side. RAMÉE, *Hist. de l'Arch.*, 8vo., 1843, i, 441. BATISSIER, *Hist. de l'Art Mont.*, 8vo., 1845, p. 188. VAUX, *Greek Cities, etc.*, 12mo., 1877, p. 98. 23. 96.

TOAD'S-BACK. The term applied to the form of a hand-rail used for a superior description of staircase. A figure is given in GWILT, *Encycl. of Architecture*, § 2189.

TOBIN'S METHOD OF VENTILATION. A column of air introduced into a room by a vertical current ascends to the ceiling, and then spreads itself uniformly throughout the enclosed space without a perceptible draught in any direction. This was introduced 1875, as a new system, by Martin Tobin of Leeds, who had proved it with good results at the town hall and elsewhere. Hence the late introduction of round and square tubes from the floor upwards, air inlets let in the wall, and other similar modern contrivances. In the following year, messrs. Shorland, of Manchester, claimed to have used vertical tubes long before the date of Tobin's letter of June 11, 1875. *BUILDING NEWS Journal*, Feb. 1876, p. 159, 165; 7 April 1876, p. 365. *BUILDER Journal*, 1877, xxxv, 93, 140, 643. ROBINS, *Sanitary Science, etc.*, read at ROYAL INST. OF BRITISH ARCHITECTS, *Transactions*, 1880-81, p. 59. 1.

TODESCA and **THODESCA**; see **TEDESCA** and **TEDESCO**. The word also appears in *L'Academia Todesca*, or *Teutsche Academic*, Nuremberg, 1675-79.

TODI (Anc. Tadturtum), a city of the Umbri and of the Etruscans. A town near Perugia, in Central Italy, situated on the river Tiber. Part of the ancient walls is as perfect a specimen of the squared masonry as any in Etruria. **LIB. OF ENTER. KNOWLEDGE**, *Pompeii*, 8vo., 1831, i, 64-5, and cut. A ruin may have been a basilica, but is known as a temple; **AGRETTI**, *Testim. e confronti sul tempio di Marte*, 4to., Perugia, 1818; and **VERMICIOLI**, *Testim., etc., di Marte*, Per., 1819. The town is the see of a bishop. The cathedral, dedicated to the Annunciation of the Virgin, dates from IX century. The church of S. Fortunato 1292 has a rich doorway, and wood carvings 1590 by Maffeo di Gubbio; there are some thirty other churches, twenty-four monasteries and sixteen nunneries: also an old episcopal palace; 1213 the palazzo comunale; the palazzo de' Prosperi; the good casamenti of Fredi, Laurenti, Ercolani, Pierozzi, Francisci, and others. The church of the Madonna di Consolazione, near the town, was designed by D. Lazzari (Bramante) about 1488. It is in the form a Greek cross with a central dome and minor cupolas; **D'AGINCOURT**, pl. 58; **FERGUSSON**, *History*, 1862, iii, 46-8; and a sketch, vii, 122, No. 301, by A. Piccone da Sangallo, exists in the collection of his drawings in the Reale Galeria at Florence. **LASPEYRES**, *S. Maria della Con. zu Todi*, fol., Berlin, 1869. 23. 28. 50. 96.

TODENARUS MARBLE; see **TENARUS**.

TOFANO, or il Lombardino; see **SOLARI** (C.).

TOFT. A message; or rather a place where a message has stood. **COWEL**, *Law Dictionary*, fol., 1727. 19.

TOFTE (JOHN), with Henry of S. Albans, were two masons working at 5½d. per day under the directions of master Thomas of Canterbury, master mason at 6d. per day, in 1330, at his coming first to Westminster and beginning on the new chapel of S. Stephen; **BRAYLEY** and **BRITTON**, *Palace, etc.*, 8vo., 1836, p. 150; **SMITH**, *Antiq. of Westm.*, 4to., 1807, p. 172-3.

TOGGLE needle, tossle, joggle, stud, or coggell. A pin or short bar. A piece of wood inserted in a wall above the head of a raking shore. **STOCK**, *Shoring and Underpinning*, 8vo., 1882. **BLAGROVE**, *Shoring and its Application*, 8vo., 1887. **ROY. INST. OF BRIT. ARCHITECTS, *Journal*, 1887, p. 266; 284.**

TOILS of a **HINGE**. These are the flat portions of a hinge, and in which the screw-holes are placed. 1.

TOISE. A measure of length equal to 1.949 mètre, or 6.3945925 Engl. ft. It was the *pied du roi*, the principal unit of measures of length of the old French system, and was subdivided into 6 ft., 72 inches, or 864 lines. It differed in localities, hence it was called the *toise d'échantillon*. It was used also, as the English "rod", as the *toise à mur*; the *toise courante*; *toise quarrée ou superficielle*; and *toise cube*, which last is given as 261.483 Engl. cubic ft., and as 9.68428 Engl. cubic yards. (**FATHOM**). **FELBIEN**, *Vie des Architectes*, 4to., Paris, 1687, p. 189,

gives the dimensions of the cathedral at Chartres in toises; and Amiens (p. 206), as copied in HAWKINS, *Gothic Architecture*, 8vo., 1813, p. 97, 139. The streets of the English towns in France were six toises wide, as at Libourne; FONS-MÉLICOCC, *Les Artistes et les Ouvriers du Nord*, 8vo., Béthune, 1848, p. 176; 194. 1.

TOKIO, or Tokai, called Jeddo and Yeddo, until Sept. 1868. The capital of east Japan, from 1590. In 1601 the whole place was burnt; tiles were not made until 1646. In 1657 occurred the great fire when 500 mansions of the *dai mio* or territorial nobility, 770 residences of *hata moto*, 350 temples, and 1,200 streets were destroyed. 1720 the prohibition against tiles was removed. On Nov. 11, 1855 the last great earthquake took place, when over 14,000 dwellings and 16,000 fireproof godowns were thrown down. Great alterations have since 1869 been effected. There are fifteen districts; the principal temples and other places of interest in each of them are described in the *Handbook to Japan*, 8vo. (Murray), 1884. CONDER, *Theatres in Japan*, in *BUILDER Journal*, 1879, xxxvii, 375, with three plates, showing the Shintomi-za theatre. BAX, *Eastern Seas*, 8vo., 1875, p. 142. FORTNIGHTLY REVIEW for May 1870. CONDER, *Notes on Japanese Architecture*, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1878, p. 179; and his *A Japanese Gentleman's House at Tokio*, *idem*, 1887, p. 181. MIACO. SHILEA and SHINTOO TEMPLE. 14. 28.

TOLEDO (anc. Toletum). The capital of the province of the same name, in Castilla la nueva, in Spain. It is nearly surrounded by the river Tagus, over which are two bridges: 1, *Alcantara*, of two stone arches, the Roman bridge was repaired 687; 871; built A.D. 997-8 by el Wasir Chalaf Ben Muhammad Alameri; damaged in a flood of 1211; its semi-Moresque gateway, rebuilt 1217-55 by M. Paradiso; restored 1380, and fortified 1484 by A. Manrique; and 2, the narrow bridge of one arch of *S. Martin*, XIII cent., broken 1368, and restored 1389 by R. Alonso or Alfonso (given in *VILLE AMIL*, iii). Part of a noble Roman aqueduct and viaduct for twenty-one miles with some hydraulic works remain; *Detached Essay*, Aqueduct, p. 17; the town since January 1870 has been again abundantly supplied with water. The Roman circus can be traced; the prætorian temple is since 621 the church el Cristo de la Vega. The city was taken 712 by the Arabs, and became second only to Cordova. The Moorish houses until 1492 (*STREET*, 223) were built of one or two stories, the apartments being arranged around a court over which an awning can be thrown, and in it is a fountain and garden or flowers. A few are still to be seen, as the now carpenter's shop in the calle de las Tornerias; el Taller del Moro (in *VILLE AMIL*, i); and casa de Mesa having one room in a perfect state: on the right bank are the ruins of a country villa called "los palacios de Galiana" (in *VILLE AMIL*, i). The country houses of the wealthy are called *cigarrales*.

In 1085 Alfonso VI of Castile and Leon took possession of the city. The *alcázar* was built by Alfonso X (1252-84) on the site of the palace built 674 by king Wamba of the Moors, a hall was added 1442 by Juan II (1406-54); it was almost rebuilt between 1537-55 by Charles V, under A. de Covarrubias and L. de Vega, and is termed Bramante-like; in 1550 the arcades were carried out by F. Gonzalez de Lara; J. de Herrera 1571 designed considerable additions for Felipe II (his pupil G. Gili or Gill being *aparejador*), as the south façade, with 1556-76 the staircase, etc.; 1572-87 D. de Alcantara was *aparejador*; in 1601-13 Herrera's design was being continued by M. Jamba; 1613 P. de Lizargarate was *apar.*, under J. B. Monegro who completed 1620 the corridor to the staircase and the two rooms of the south façade from Herrera's design; 1643-73 J. de Ortega was *mm.* In 1843 it became dilapidated; was fitted up 1877 as a school for cadets; was under restoration in 1885-6 by Pablo Vera (B. J., 1886, l, 701); and suffered much damage by fire 9 January 1887 (*SOCIETY OF ANTIQUARIES, Proceedings*, 1887, xi, 234).

CONDE, *Arabs in Spain*, 8vo., 1854, i, 509, mentions that the architect Fatho Ben Ibrahim el Omeiyeh, known as Aben el Caxari, of Toledo, had shortly before 982-3 completed two large

ARCH. PUB. SOC.

mosques, that of Gebel Berida, and of Adabigin, at Toledo. The synagogue of *Santa Maria la Blanca*, XII cent., altered by Moorish workmen in XIV; was a church in 1405; it has five ailes, and is 87 ft. by 65 ft. (in *VILLE AMIL*, ii); also La iglesia N. S. del Transito, or S. Benito, completed 1366, one room, a curious specimen of Arab art (in *VILLE AMIL*, ii), with a fine arsesinardo roof. The mosque, now church of S. Cristo de la Luz, was standing in 1085, and the mosque de las Tornerias (*STREET*, p. 213-5; and p. 25 of work below); its brick apse was added 1186 by the Templars. The puerta de Sol, the grand chief entrance gateway to the Moorish city (GIRAULT DE PRANGEY, *Arch. des Arabes et des Mores*, 8vo., Paris, 1841, pl. 2; CAYEDA; *STREET*; and B. J., 1885, xlix, 356); the puerta Lodado, also Moorish; the puerta de Visagra, *cir.* 1108-26, given in *STREET, Brickwork in Middle Ages*, in *CHURCH BUILDER Journal*, 1866, p. 23; the new puerta Visagra dates 1550; and puerta de Cambron, 1576. JALUBI of Toledo practised in time of prince Nazar (1180-1225).

Toledo is the see of an archbishop the primate of all Spain. The cathedral dedicated to the Assumption of the Virgin, is the largest in the country and stands on the site of a Moorish mosque. FERGUSSON compares it with Bourges in France. It was commenced 1226 or 14 Aug. 1227, and the foundations laid 1258 or 1264 by Petrus Petri or Pedro Perez as designer. The following list of the other "architectos maestros mayores" and "aparejadores" or resident architects, is given by LLAGUNO:—

1380 *cir.* R. Alonso or Alfonso.

1418 Alvar Gomez, *apar.*, at work on the principal façade, and 1425 of the tower, and the building considered complete 1492.

1459 A. Egas de Bruxelas, *mm.* 1481-84 M. Sanchez Bouifacio.

1481-94 Juan Guas, or Geras. 1494 H. de Egas.

1500 P. de Gumiell arranged works for the capilla mayor.

1500 M. de Solorzano worked on the building. 1509 A. de Egas.

1534 Oct. 15, A. de Covarrubias, who 1566 was pensioned, and died 1570.

1566 Oct. 1, F. Gonzalez de Lara, died 31 August 1576.

1576 Sept. 1, N. de Vergara el Mozo.

1582 Feb. 25, D. de Alcantara, died 11 April 1587.

1587 June 9, N. de Vergara II to Dec. 11, 1606.

1606 J. B. Monegro, died 8 Feb. 1621.

1622 T. Gonzalez (temporary), pensioned in 1625.

1625 March 10, J. M. Teotocopuli, died 29 March 1631 (1627, D. Cerdano, *apar.*).

1631 Aug. 16, L. Fernandez de Salazar, died 4 July 1643.

1643 Aug. 13, F. L. de Goyti (1647 J. de la Pedrosa employed), died 17 Aug. 1653.

1650 J. de Aranda Salazar surveyed and reported on the works.

1656 Feb. 14, C. D. Peñalacia, died 4 Aug. 1657.

1657 Aug. 24, J. de Ortega, pensioned 18 June 1671, died 3 Jan. 1673.

1671 June 18, B. Z. de Salcedo, died 14 Aug. 1682.

1685 Aug. 13, J. Donoso, died Sept. 1690.

1691 March 21, T. Ardemans, died Feb. 1726.

1721 Oct. 27, N. Tomé in the sickness and absence of Ardemans.

1772 Nov. 17, V. Rodriguez, died 26 Aug. 1785.

1773 Aug. 15, E. Lopez Durango, *apar.*, 28 Jan. 1786 *mm.*, pensioned 9 Sept. 1793, died 5 Sept. 1794.

1794 Sept. 21, Ign. Haan, maestro mayor.

CEAN BERMUDEZ enumerates 149 of the best artists of the country as having been engaged on the works during six centuries.

It has five ailes with small chapels beyond. It is 404 Sp. ft. (395 ft.) long; 202 sp. ft. (178 ft.) wide, and 160 sp. ft. high (105 or as MILIZIA says 116 ft.), ailes 60 and 35 ft. high; the nave is 50 ft. 6 ins. wide between centres of columns. Interior view in B. J., 1887, liii, 234. The north tower 325 ft. high, finished 1535, is the only one complete. The seventy stalls were executed 1495 by el maestro Rodrigo, the upper portions 1539-43 by F. Vigarny, or de Borgona, and A. Berruguete; Vigarny also worked the throne. Side of high altar in B. J., 1887, liii, 234. Of the twenty chapels, the most important are:—The capilla mayor enlarged by cardinal Ximenez (1495-1517), it contains the mausolea of many early kings and princes, that of cardinal don Pedro de Mendoza has a beautiful plated iron railing. The large capilla di Santiago or et condestable dates 1442; the stalls *cir.* 1495 by Rodrigo. The capilla San Ildefonso

at the head of the building was founded by Alonso VIII (1494-95). The large capilla Neustra Señora de los Reyes Nuevos at the north-east angle, 1531-4 by A. Monegro under A. de Covarrubias; 1530 D. de Siloe also made a design; and 1575 D. de Alcantara, containing tombs of several kings and their wives, all deserving notice; the retablo dates 1777. The capilla Muzarabe (*capellita* to the tower by A. de Covarrubias?), in the south tower is a curiosity of its kind, it was founded 1510 by cardinal Ximenez; 1519 the drum of the dome by H. de Egas; 1625 the cupola and lantern by J. M. Teotocopuli (see A. de la MADRE DE DIOS); the Gothic entrance and chapel are also placed 1631 to T. Jorge. Of the entrances to the church, the fine puerta del Leones on south side, is the work 1459 of A. de Egas, and J. Fernandez de Liena and J. Aleman 1466, restored 1776 (B. J., 1887, liii, 234); its fine outside bronze doors (Door; metal) 1545 by F. de Villapando; the inside carved 1541 by D. Copin of Holland, with six other artists. The puerta de Reloj or de la Feria on north side is the oldest doorway, the bronze doors to match the others were cast 1713. The principal, or west, entrance in B. J., 1881, xl, 504; and 1887, liii, 234.

The sala capltular de Invierno, the winter chapter-house, has good Moorish work, and rich wardrobes; one, cinque-cento 1549-51 by G. Pardo; another 1780 by L. Durango: the ceiling is also cinque-cento work: the square portal by B. Bonifacio, and the doorway 1504 by A. Gutierrez after designs by A. Rodriguez. The sagrario, sacristia, capilla del ochavo (of Lady chapel) with other saloons were planned 1588 by cardinal Quiroga; the ochavo is attributed 1607 to J. de la Pedrosa, 1625 G. B. Crescenzo, 1631 J. M. Teotocopuli, completed 1653 by F. L. Goyti; "begun 1616 by J. B. Monegro and finished 1652-8; the grand entrance of the former dates 1610." The capilla Neustra señora del Sagrario 1595-1616 is by A. de Encinas, N. de Vergara, jun., under A. Monegro. The cloister 1389 is good; it with the capilla de S. Blas for archb. Tenorio (d. 1399), were designed by R. Alonso or Alfonso; its four gates are of beautiful work; that of Sta. Catalina; 1565 nueva or de los presentacion; and de los Canonigos is by A. de Covarrubias.

Formerly there were the cathedral and 110 churches, including 11 sanctuaries inside and outside the town (now only 59); viz., 2 Muzarabic, 9 Latin with their 12 assistant parishes, 15 nunneries and 21 chapels. The following are noteworthy:—The church and cloister of San Juan de los Reyes "an exquisite and refined example of the Florid Gothic period" erected from 1500 or between 1476-1610 by Ferdinand and Isabella as their sepulchral chapel, designed by Juan Geras (or Guas); the north doorway of chapel 1565-1609 by A. de Covarrubias (BUILDER JOURNAL, 1882, xlii, 173; and 1883, xlv, 412; outside of choir, *idem*, 1887, liii, 562: a stone cross, 1884, xlvii, 99); the cloisters (BUILDING NEWS JOURNAL, 1860, vi, 499); the monastery was burnt 1809; later was to be converted into a school of art; and restored by Artura Melida (B. J., 1886, l, 667); the church is remarkable for the elaborate heraldic carving; the retablo and stalls are attributed to Phil. de Bourgogne. The parish church of Santo Tomé has a brick Moorish town (in VILLE AMIL, ii); La iglesia de los Minimos dates 1550, by A. de Covarrubias continued by F. Gonzales de Lara, and by M. Lopez, who did several works, 1596 A. Garcia and J. Martinez Calvo. The parish church of S. Roman and its tower has Moorish work (in VILLE AMIL, iii). The church of S. Bartolomeo has an apse 30 ft. across outside; that el Cristo de la Vega, 621 is on the site of the praetorian temple. The nunnery of S. Domingo el real; of Santiago or Santa Fe, which has two fine courts (*patios*) having pillars and porcelain tiles; its chapel has a semi-Moresque oratory: S. Juan de la Penitencia (Franciscan) founded 1511 by cardinal Ximenez; with Santa Domingo de Silos (Bernardine) its Ionic chapel by D. Teotocopuli. Of the former 34 hospitals four only are left. The magnificent hospital of Santa Cruz, founded 1504 by cardinal Mendoza, designed 1480-92 by H. de Egas, has a rich plateresque staircase (in VILLE AMIL, ii) and fine portal (B. J., 1885, xlix, 356); it is now a military college. The hospital (Italian) of S. Juan Bautista or el

hospital de Afuera, outside the town, was built for cardinal Tavera 1541-61, designed by B. da Bustamante, was commenced by F. Gonzales de Lara (in VILLE AMIL, ii); and continued by N. Vergara, jun.; 1550-76 the fine *atrio* by A. de Covarrubias; the retablo 1609 by D. Teotocopuli; a fine cinque-cento tomb, with four statues, by Berruguete. Hospital of San Juan de la Penitencia founded 15... by cardinal Ximenez (1495-1517); one is given in WARING AND MACQUOID, *Arch. Art.*, fol., 1850.

The archbishop's palace has a façade designed 1617 by Gomez de Mora, but is probably by J. B. Monegro; carried out 1621-30 by S. de la Plaza, maestro de las obras to the archbishop; 1628 J. G. de San Pedro; 1636 F. de Espinosa; its portal is later and fine. The adjoining *casa del ayuntamiento* by D. Teotocopuli has a good staircase. The nuncio nuevo, or lunatic asylum, XVIII cent. The universidad literaria, XVIII cent., its four colleges are gone. 1775 the colegio de doncellas nobles. Besides many fine works of sculpture in the city, the statue of S. Eugenio by A. Berruguete or Monegro, is noticeable.

QUINTANA, Toledo, fol., Madrid, 1651. ROJAS, *Historia del Ciudad de Toledo*, etc., fol., Madrid, 1654-63. MEUNIER, *Diverse Venes*, etc., 3 pl., obl. 4to. (1650?). ALCOZER, *Hystoria*, fol., 1554. ASSAS, *La Catedral de Toledo*, 1857; and ASSAS, *Album Artistico de Toledo*, fol., 50 liths. of antiq., arch., art treasures, etc., in churches, etc., and has accurate translations from the Arabic by Gayangos, Toledo, 1848. CAVEDA, *Ensayo hist.—de Arquitectura en España*, 8vo., Madrid, 1848. WELLS, *Pict. Ant. of Spain*, 8vo., 1846, p. 103. TAYLOR, *Voyage en Espagne*, 4to., Paris, 1826; 1832. *Description de la imperial Ciudad de Toledo*, 4to., Toledo, 1605; reprinted 1617. SWINBURNE, *Travels through Spain*, 4to., 1779. ESPAÑA SAGREDA, vols. v and vi. PONZ, *Viaje*, 16mo., Madrid, i, 1787-94. MIÑANO, *Dicc. Geografico*, viii, 444. ESCOSURA ED VILLE AMIL, *L'Espagne Artistique*, fol., Paris, 1842-59, gives about 40 plates in the three vols. BUILDER JOURNAL, 1852, x, 180, by J. B. Waring. ECCLESIOLOGIST JOURNAL, 1849, ix, or vi, New Ser., p. 103. *Toledo en la Mano*, Tol., 1857. AMADOR DE LOS RIOS, *Toledo Pintoresca*, Madrid, 1845. STREET, *Gothic Arch. in Spain*, 8vo., 1865. FERGUSSON, *History of Arch.*, 8vo., 1867, ii. SPANISH GOVERNMENT, *Monumentos Arquitectonicos de España*, fol., 1859-86, contains many plates. *English Illustrated Magazine*, fol., 1884-85, p. 524. 1. 14. 28. 50. 66. 96.

TOLEDO (JUAN BAUTISTA DE), was born at Madrid. In 1547 he studied at Rome, and visiting Naples was engaged by the viceroy don Pedro, marquess de Villafraanca, as "director de las obras reales de Nápoles". Among other works he 1540 laid out the strada di Toledo (from 1870 called the strada di Roma), it is about 1½ miles long, and is sometimes attributed to G. Merliano; the church of Santiago, or S. Giacomo degli Spagnuoli, also said to be by G. Merliano assisted by F. Manlio; in it is the fine tomb of don Pedro, died 1554; about 1546 the square bastions to the castel nuovo; a large palazzo at Posilippo, or Pausilippo; fountains, and other works. He left Naples 15 July 1559, for Spain, being nominated by Philip II architect to all the royal works; was "inventor" of the monastery of the Escorial near Madrid, of which he laid the first stone April 23, 1563, as stated on a stone in the church portico (J. DE HERRERA). He selected L. de Escalante and P. de Tolosa as the two resident architects or *aparejadores*. At Madrid 1560 he designed the casa de la Misericordia, and the façade of the church de las Descalzas reales; 1561 works at castle at Aceca; 1566 palace at Aranjuez; 1572 at Martin Muñoz de las Posados, the palace of the cardinal Espinosa; 1574 villa at Esteban de Ambran for the secretary D. de Vargas; and LLAGUNO, ii, 273, notices the rewards for merit and services given to him. He died May 19, 1567, at Madrid, and was succeeded at the Escorial by J. B. de Herrera who had been his pupil from 1562. G. Gill or Gili, and Juan de Valencia were also pupils. 3. 65. 66. 68.

TOLEDO (PEDRO DE), with F. de Rodriguez and J. de Hocces were 1472-78 maestros mayores at the same time of the works at the cathedral at Seville, succeeding 1462 J. Norman. 66. 68.

TOLENTINO (the ancient Picenum). A town near Macerata,

in central Italy, situated on the left bank of the river Chienti. The bridge dates from 1268. The entrance gateway presents one of the most remarkable specimens of castellated architecture of the middle ages; HOPE, *Architecture*, 8vo., 1840, pl. 63. The town was created 1586 into a city by pope Sixtus V. The cathedral dedicated to S. Catero martire and S. Nicholas of Tolentino, originally Gothic, has been very much altered, but the rich doorway in its façade remains unaltered; there is a richly gilt roof of carved wood with figures. SANTINI, *Saggio di memorie della città di Tolentino*, 1789. 28. 50. 96.

TOL HOUSE, Tolsey, Tholsel, or toll stall. A toll is claimed by the owner of a port in respect of goods shipped or landed there, and are called port-tolls or port-dues; the place at which they are assessed was anciently called Tolsey, as at Dublin; and at Gloucester where it "consists of a timber piazza below and antic figures over the capitals, an overhanging story with immense sashes and a balustrade above"; FOSBROKE, *Gloucestershire*, 4to., 1807, i, 202: VETUSTA MONUMENTA, ii, pl. 8. One of the most interesting specimens is at Great Yarmouth, Norfolk, erected XIII cent., and so called since 1360. The ground floor was long used as a gaol. It was much renovated in 1875; BRITISH ARCHITECT *Journal*, p. 27, with a view and a doorway. The "Tholsel" in Dublin was erected 1683, and contained the recorder's court, Guildhall, and other city rooms; MALTON, *Dublin*, fol., Dublin, 1793, pl.

TOLLET. A term used in Herefordshire for a HAY-ROOM. "Tallut" in 1635 in Worcestershire.

TOLLUS (ADRIANUS), a mathematician, was born January 19, 1783, at the Hague. He designed the village and Roman Catholic church of Ryzenburg, near Utrecht; of S. Thomas at the Hague; of Wyk; and of Schiedam; also the fine chapel on the Roman Catholic cemetery near the Hague; and the tower of the church at Schalkwyk, near Utrecht; with other private works. He died January 8, 1847, at his native place. GOETGHEBUER, *Choix des Monumens*, fol., Ghent, 1827, p. 105, names the church at the Hague as of S. Willebrord, 1821-22. 24.

TOLMEN. The name given to a holed stone of the Celtic period. The tolmen, or Mên rock, in parish of Constantine, Cornwall, 33 ft. long, 19 ft. wide, and 14 ft. high, weighing about 800 tons, fell into a quarry about 40 ft. deep; BUILDING NEWS *Journal*, 1869, xvi, 247. The DOLMEN is a large stone raised on smaller ones and open through. 1.

TOLOMEO (DOMIZIO and GIOVANNI LEO). See RAINALDI (A.).

TOLOSA. The ancient name of TOULOUSE, in France.

TOLOSA (PEDRO DE), 1574-76 with L. de Escalente were architects and aparejadores de cantería at the Escorial, by appointment of J. B. de Herrera, and was succeeded by J. de Minjares. Pedro was removed 1576 to the monastery at Uclés with a higher salary. His son Alonso is noticed under 1583 in the registers. 66.

TOLOSA (JUAN DE), a Jesuit, brother and pupil of PEDRO, designed 1591 the hospital and church at Medina del Campo; and as aparejador he worked and studied at the Escorial. 66.

TOLOSA (JUAN) of Biscay, 4 April 1488 designed the collegiate church of Sta. Maria dos Anjos at Caminha; its towers were added and finished 1556 by D. Eannes, a Portuguese. RACZYNSKI, *Lettres, Les Arts en Portugal*, 8vo., Paris, 1846, p. 413. 68.

TOLOSA VOLCARUM; see TOULOUSE.

TOLSEY; see TOL-HOUSE.

TOLTEC and **TOLTEQUE**; see TOUTEC ARCHITECTURE.

TOLUCA. A town near Mexico, situated in a valley 8,606 ft. above the sea level. It is a well-built handsome place, and has a well-built cathedral. 14. 50.

TOLY or **TULLEY** (ROBERT), a monk; see SEBROKE (T.).

TOMÁS (DOMINGO), a native of Cervera in Catalonia, learnt the arts of stone-cutting and masonry. Going to Madrid he applied himself to architecture in the academy of S. Fernando and obtained the grade of académico mérito 4 June 1786. He went to Granada and was appointed director of architecture in

the school of drawing. He designed the tabernacle in the parish church of S. Pedro at S. Pablo; a retablo in that of S. Matias; of S. Francisco and the sacristy of Sta. Escolastica at Granada; the parish churches of Alboludui, Solar, and Montillana; the presbytery of the church at Loja; and an hermitage of the Granadilla; completed the façade of the church at Guadix; and repaired and built many bridges and high-roads in the province. 66.

TOMB (Gr. *τύμβος*; Lat. *tumba*; It. *tomba*; Sp. *tumba*, *sepulcro*; Fr. *tombe* and *tombeau*; Ger. *grabmal*; Arab. *kubbeh*; *kouryan* of old Russia. A mass of masonry or other work raised over the remains of the dead, or of a vault used for interment. The form of the sepulchre or TOMB, among the primitive nations of the world, varied in different lands. The Egyptian tombs of the early period were pyramids, as at Memphis and Sakkarah, and later at Meroë; truncated as at Memphis. Down to XXVI dynasty (cir. VII cent. B.C.), rock-cut excavations were used, as at Beni Hassan, Thebes, and other places. As regards Assyria it is stated that in the time of Alexander, old monuments abounded in the Lamlun marshes, 76 miles south of Babylon; and ARIAN writes that "the tombs of the Assyrian kings were reported to be placed in the marshes; nearly substantiated by messrs. Frazer and Ross finding glazed earthenware coffins on some of the existing mounds" (p. 106). Funereal urns were found in a mound by BOTTA, containing calcined bones, but no fragment large enough for proof of man or some other animal (p. 329); BONOMI, *Nineveh and its Palaces*, 8vo., 1852. The Greek nation often burnt the body on a pile, the ashes being collected and placed in an urn. If buried, the body was placed in a coffin. The Greek tombs if formed underground the structure were called HYPOGAEUM; and Hypergaeum when aboveground. The tombs were I, *stelai*, pillars or upright stone tablets; II, *ktones* or columns; III, *vaidia* or *crota*, a small building like a temple; and IV, *trapesai*, flat stones or *mensæ*: the *cerameicus* at Athens gives good examples of all forms; MURRAY, *Greece*. The Roman nation often burnt the body on a pile called *pyra* and *rogus*, but often the bodies were buried. The place of burning was called *bustum* if the body were buried there, and *ustrinum* if buried elsewhere. Bones were placed in an urn, of marble, alabaster, or baked clay, generally square in form. *Sepulcrum* or *monumentum* was any kind of tomb where the body was buried. A tomb fitted up with niches or recesses was called *columbarium*; the best of these was discovered 1822 at the villa Rufini, beyond the porta Pia, at Rome. *Conditiora* or *conditiva* were sepulchres underground, in which entire dead bodies were placed. The coffin, frequently of stone, was called *arca* or *loculus*; and from the property attributed to Assos stone it was called SARCOPHAGUS; (TRACHYTE), and the term became applied to all large detached tombs or coffins. The ordinary tombs were simple epitaphs cut in marble or stone; or CIPPUS or funeral column, more or less decorated. The sepulchres of the Roman emperors were very imposing. A GENOTAPH is a tomb without the corpse being interred under it. The "sepulchro di Nerone" near Ponte molle is a specimen of the Roman tombs of the cubic form; a larger one is on the Via Portuensis. Of a circular form is that of Manutius Plancus at Gaeta; also one at Pompeii, in which the dome is obtained from out of the solid mass. Between Torredembarra and Vendrou, between two and four miles from Tarragona, in Spain, is a ruined Roman arch called "Arco de Bara"; the inscription was EX TESTAMENTO L. LICINI L. F. SERG. SURAE (7) CONSECRATUM. and is given in the *Handbook to Spain*. A square with an arch on each side finished by a pyramid, is the so-called tomb of Pontius Pilate, at Vienne in France. A square tower-like tomb, richly decorated, exists at Igel, near Trèves; at S. Remi, in France; many ruins of similar ones at Arlon, in Luxembourg; WILTHEMIUS, *Luciliburgensia*, etc., 4to., Lux., 1842. *Pays Bas avant—la dom. Romaine*, ii, 255. Tower tombs as at Palmyra (WOOD, *Palmyra*, fol., 1753); at Shuka and Shuhba, in Bashan, 20 ft. square; at Kemawât or Keneth; PORTER, *Giant Cities*, 8vo., 1867, p. 36-7, 43, 55. At Périgueux,

a tower about 200 ft. in circumference and 64 (or 100) ft. high, supposed sepulchre or mausoleum. At Pompeii, the sepulchral structures are very numerous, forming what is called the "Street of the tombs"; instead of cemeteries or public burying grounds, it was the custom in ancient Italy to erect tombs on each side of the principal roads leading from a city, as the Via Appia, and others close to Rome.

Some Etruscan tombs were built, and some excavated; at Phigalia in Messene, the Etruscan mounds often enclosed high towers, both square and round; and there is a round tower similar to that of the Etruscan circular tumulus next to the two called Horatii and Curatii, on the Via Appia; DENNIS, *Etruria*, 8vo., 1878, 2nd edit. The tombs in Lycia are of peculiar form (FELLOWS, *Asia Minor*, 1852, p. 255-6, 278, 296, 312, 322, 463, 497). In Judaea is a series of very curious sepulchres, as at Sidon (whence have been obtained some of the finest sarcophagi known, and now at Constantinople); those of the kings and others, with the tomb of the Holy Sepulchre, in and around Jerusalem; PERROT AND CHAPIER, *RENAN, DE VOGÜÉ, AND WADINGTON*. The Indian mausolea were often very grand, as the Taj mahal at Delhi; BEEJAPORE; and others named in FERGUSON, *Indian, etc., Architecture*, 8vo., 1876: some fine examples of their sarcophagi are to be seen in the Indian court at the South Kensington museum. Beautiful Mahomedan tombs exist at Cairo and elsewhere. Little can be written of the tombs of China; a short account is given in *Detached Essay*, Chinese Architecture, p. 19.

A work might well be written as to the tombs erected in all countries during the mediæval period, as the interesting examples of the Scaliger family at Verona. They are mostly within buildings; they exhibit almost every variety of form and enrichment, as may be seen at Westminster abbey; York, Canterbury, Winchester, and other cathedrals, and many parish churches, in England and on the continent. The tomb of a founder or benefactor within an arch and canopy was usually placed at south-east corner of the transept, and often on north side of the chancel. Incised floor tombstones as at Florence; and brasses, have been referred to in this dictionary.

By a law of Kenneth, king of Scotland, in VIII cent., it was enjoined that a cross should be put upon every gravestone, or coffin-lid, first by the use of incised lines drawn around the object, second by producing the form in low relief, or third by a wholly excised figure. The tombs to be met with in England may be classed as follows:—1. Sculptured coffin-shaped stones, prismatic and plain at top. 2. Prismatic and carved on top, with crosses plain and flory. 3. Tables with effigies or sculpture. 4. Incised slabs and sunken effigies, i.e., slabs showing a part only of a figure, in an open circle or quatrefoil, at the head, or feet, or both. 5. Plain and low sepulchral recesses with or without either of the above. 6. Canopied mural tombs differing from 5 in size, projection from the wall, and degree of richness. 7. High tombs, often bearing a brass, or an effigy of stone, alabaster, or brass. 8. Slabs inlaid with a brass, and later all of brass, mostly of XIV century. 9. Floor crosses and Lombardic slabs. 10. Chiefly since the Reformation; tablets and memorials against the wall; and 11. Detached edifices, as the mausoleum, obelisk, column, statue, equestrian figure, and various groups. ECCLESIOLOGIST *Journal*, 1845, iv, 19; abridged in CIVIL ENGINEER, ETC., *Journal*, 1845, viii, 82; with additions. *Style of Sepulchral Monuments*, in MORANT, *Indications of Date*, 8vo., London, 1870, p. 36. GODWIN, *English Archaeologist's Handbook*, 8vo., 1867, p. 275.

In Italy are many *façade* monuments, large architectural compositions, "macchine colossali" of CIOGNARA, as the monument of the doge Valier by Tirali, and that of the doge Pesaro by Longhena. Also the simple *deposito*, or sarcophagus with a recumbent or semi-recumbent figure, present examples of much merit. Sculptors later than the mediæval period have given in elevated tombs, figures of saints, allegorical compositions, and groups of mythological figures, like many constructions in S. Paul's cathedral and Westminster abbey; sometimes some

celebrated actions of the deceased were represented, while the tombs of princes and distinguished men have opened a vast field of art for sculptors. 1. 2. 7. 14. 17. 19. 25.

BARROW. CATACOMB. CORPSE MONUMENT. GRAVE STONE. MAUSOLEUM. MEMORIAL. PARSEE. PEBBLE PAVEMENT. POLY-ANDRION. ROUND TOMB. SEPULCHRAL MEMORIAL. SHRINE. SKELETON FIGURE. SLAB. STATUE. TUMULUS. *Illustrations*, Tomb, i, 1849-50, pl. 245; and Canopy, i, 1857-58, pl. 37; 56.

Tomb; contract for:—

- 1395 Richard II, in Westminster abbey. RYMER, *Federa*, edit. 1709, vii, 795. GOUGH, *Sepul. Monuments*, i, 167.
1417 Richard Green, in Lowick or Luffwick church, Northampton. HALSTEAD, *Genealogies*, 189. WILLIS, *Nomenclature*, 79. HOARE, *Wiltshire*, s. v. Warminster Hundred. ARCHITECTURAL SOCIETIES, *Reports and Papers*, 1883, p. 59.
1447 Richard Beauchamp, Warwick. BRITTON, *Arch. Antig.*, iv. DUGDALE, *Warwick*, edit. 1656, p. 329. BLOER, *Mont. Remains*; POOLE, *Hist. of Arch.*, 386.
1511 c. Marguerite of Bourbon, and others at Brou. BORDIER ET CHAR-
TON, France, ii, 124.
1512 Henry VII, by P. Torreggiani, at Westminster. SPEED, *History*,
1516 1087. BRITTON, *Arch. Antig.*, ii. ACKERMANN, *Westminster Abbey*, ii, 140.
1518 Henry VIII, by P. Torreggiani. ARCHÆOLOGIA, 1812, xvi, 84.
1581 At Somerton, Oxfordshire. ARCHÆOLOGICAL *Journal*, viii, p. 181-5.
1582 At Bredon-on-the-Hill, Leicestershire. *Stemmata Shirleiana*, p. 60.
1618 James Montague, bishop of Winchester, in Bath Abbey church, by William Cure for £200. DINGLEY, *History of Marble*, by Camden Society, 1868, p. 155.
1624 Sir Paul D'Ewe, Stowlangtoft church, Suffolk, by Jan Jansen for £16 10s. British Museum, *Harl. MS.* 98, art. 20.
1629 Sir William Pelham, Brocklesby church, Lincolnshire. William Wright, graver in stone, for £100, plot drawn by him. NOTES AND QUERIES *Journal*, 3 Ser., x, 22.

HORNSTEIN, *Les Sépultures devant l'histoire, l'archéologie, la liturgie, le droit ecclésiastique et la législation civile*, 8vo., Paris, 1868. MONTFAUCON, *Mons. de la Monarchie Française*. STACKELBERG, *Die Gräber der Hellenen*, 1837. BECKER, *Charikles*, ii, 166-210; and GALLUS, ii, 271-301. MAZOIS, *Pompeii*, pt. 1, pl. 18. ROSSI, *La Roma Sotterranea Christiana; Il Cimitero di Callisto presso la via Appia*, fol., Rome, 1868. GOZZINI, *Monumenti Sepulcrali della Toscana*, 4to., 73 pl., Flor., 1821. MONTANO, *Raccolta*, etc., Temples and Sepulchres from the Antique, fol., Rome, 1638. PICAET, *Ceremonies, etc., Religieuses*, fol., Amst., 1723-37. MADDEN, *Shrines and Sepulchres of Old and New World*, 2 vols., 8vo., 1851. JOLIMONT, *Père la Chaise*, 4to., 1821-23. ROUSSEAU ET LASSALLE, *Père la Chaise, etc.*, 4to. *Sepulchral Antiquities in Rome*, in BUILDER *Journal*, 1863, xxi, 562-3. CLOCHARD, *Monuments, etc., en Italie*, fol., 1833. CANOVA, *Tombe d'illustri d'Italia*, 4to. SPINK AND HULLMANN, *Mausolées de douleur, etc., pour tous les Nations*, 4to.; and *Ursprünge der Kirchenverfassung des Mittelalters*, 8vo., Bonn, 1831. NORMAND, *Mons. Fun. choisis dans les Cimetières de Paris, etc.*, fol., 1850. QUAGLIA, *Les Cimetières de Paris*, 24 plates, fol., Paris, 1859. TOTTIE, *Sepul. Mons.*, fol., 1839; 1846. BENVENUTI, *Mons. Sepul. del Toscano*, 1819. RAGGI, *Mons. Sepul. eritta in Rome*, 8vo., 1841. DALY, *Architecture Funéraire Contemporaine*, fol., Paris, 1871.

Besides publications in England given s. v. sepulchral effigy, are:—WATSON, *Memoirs of Earls of Warren and Surrey*, 4to., Warrington, 1732. CARTER, *On Christian Gravestones*, 8vo., 1847. STOTHARD, *Monumental Effigies of Great Britain, to Henry VIII*; text by John Kempe; new edition by John Hewitt; 4to., 1876. ROBINSON, *Carved Panels for Headstones, Crosses, etc.*, 4to., 12 pl. CLARKSON, *Designs for Fonts, Mural Tablets, etc.*, 4to., 48 pl. GIBBS, *Architecture*, fol., 1728, gives wall tombs and tablets. THEO. SMITH, *Designs for Christian Memorials*, 4to., 53 pl., 1865. TRENDALL, *Monuments, Cenotaphs, Tombs, Tablets*, 4to., 30 pl., 1850. FAULKNER, *Mural Monuments, Tombs, and Tablets*, 4to., 1835. HAREWELL, *Modern Tombs*, 4to., 1850. MALIPHANT, *Sepulchral Monuments, etc.*, 4to. BRANGWYN, *Gothic Memorials*, 8vo., Wolv., 1861. FORSYTH, *Book of Designs for Mural and other Mons.*, 4to., 1864. ROBINSON, *Designs, In*

FIG. 1.



FIG. 2.

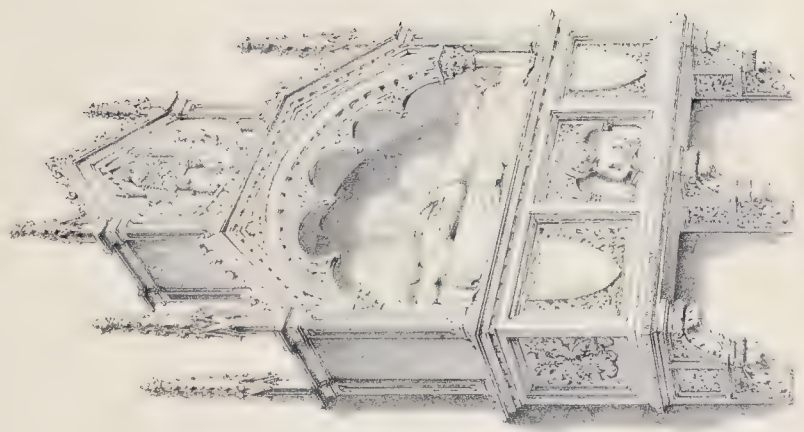


FIG. 3.



Memoriam, 4to., Derby, 1862, and other works. TARVER, *English Movements of XVI and XVII cents.*, read at ROYAL INST. OF BRITISH ARCHITECTS, *Transactions*, 1883-4, p. 39.

TOMBA (LOTARIO), born at Piacenza; designed the chapel of the Virgin in the church of S. Giovanni in Canale; repaired the palazzo del governo of the xv cent.; and designed 1803-4 a theatre.

TOMBELLAS. The French name for the tumuli found in various parts of France, and called BARROWS in England. 2.

TOMB STONE. See THROUGH STONE.

TOMÉ (NARCISO), was also painter and sculptor. On Oct. 27, 1721, he was at work at the cathedral at Toledo, after T. Ardemans, where he designed and carried out the richly decorated retablo (*transparente*) at a cost of 200,000 ducats; and 1730 or 1738 designed another (removing the fine old altar) for the cathedral at Leon, carried on by his pupil and nephew, S. Tomé Gabilan. 66.

TOMÉ (EL MAESTRO), of Andalucia, built 1214 a temple in Sanlúcar la Mayor, near Seville, no longer existing. FLOREZ, *Espana Sagrada*, ix, 121. 66.

TOME. A coarse sort of mortar. Award signed Oct. 28, 1673, by sir Christopher Wren, architect, addressed "To the Worshipfull the Committee of ye Publique Works of ye City of London, respecting the sum to be paid for works performed, at the keys of Fleet Ditch", the question being whether the price charged by the builder, viz., £13 10s. for a rod of work, applied to the customary statute rod of 272 ft. of one-and-a-half brick in thickness, or only to the facing of four-inch work set in "tomes". Wren gave his award in favour of the builder being paid the above-named sum for the facing. Records exhibited at Ironmongers' hall, 1861, 4to., 1869.

TOMMASINO (VALERIO), of Cremona, practised about 1206-1245 at the cathedral; and at the palazzo civico, piazza grande; *La Virtù ravvivata del Bresciani*, p. 185, 215. 68. 105.

TOMMASO LOMBARDO; see RODARIO (T. di).

TOMMASO; of Pisa; see PISANO (TOMMASO).

TOMMASO SICILIANO; see LAURETI (T.).

TOMON; properly DUMOT; see THOMON (T.).

TOMSK. A town of western Siberia, in Asiatic Russia; situated on the right bank of the river Tom. It was built 1604 by order of Boris Godunof at the request of a Tatar prince. The houses are of timber. It consists of the upper or Russian town, and of the lower town or suburb occupied by the Tatars and Bokharians. There are twenty churches, of which the cathedral has been lately built; two monasteries; several mosques with their minarets; law courts; bazaar; and prison. COCHRANE, *Journey through Russia*, 8vo., 1824, i, 197. BELL, *Travels from S. Petersburg*, 12mo., 1764, i, 181. 28.

TON and TUN. A modern weight. FOTHER. LOAD. It consists of 112 lbs. = 1 cwt. 20 cwt. 2,240 lbs. = 1 ton. The Cornwall miner's ton is 21 cwt. of 112 lbs. = 2,352 lbs. For ships, a ton by bulk is equal to 40 cubic ft.; and by weight 20 cwt. A mètre ton = 1,000 kilogrammes. A cubic mètre of water is equal in volume to 35.3174 ft. English, or to 220.0967 imp. gallons. As it is nearly equivalent to the old English tun of four hogsheads holding 35.248 cubic ft., and as it has been for some time in use on the Continent for measuring sewage and water-supply, it is now employed for the same purpose in England. Sea water, 1 cubic ft. = 64 lbs.; 35 cubic ft. = 1 ton. The *Price Books* contain lists of the cubic feet of stones, marbles, timbers, earths, and other materials weighing a ton. In the valuation of warehouses, the only safe method of coming at the value of a rental is by the quantity of goods or "tonnage" they will contain after leaving proper gangways, and not overloading the floors. For corn, the squares of floors are taken. 1.

TONDINO. The Italian term used by old writers for the astragal, bead, or torus under an ovolo molding. MOXON, *Vignola Abridg'd*, 8vo., 1703, p. 24. 4.

TONGELEN and Tongern (Ancient Aduatica; Fr. and Engl. ARCH. PUB. SOC.

Tongres). A town in the province of Limbourg, in Belgium, situated on the river Geer or Jaar. It was devastated in 451, 881, 1468, 1675, and 1677 by fire. It is the see of a bishop transferred to Maastricht and then to Liège. The church or cathedral *cir.* 314 on a temple to Apollo, dedicated to Notre Dame, is said to have been the first on this side of the Alps dedicated to the Virgin; it was rebuilt 1240: the tower begun 5 May 1441; the interesting cloisters (romanesque) are supposed to have belonged to the church of *cir.* 980: the choir, nave, south transept, and aisles are xiii cent.; the north transept and chapel, xv cent.; the tower begun 9 May 1440 was not completed till 1502; the spire was burnt 1677: Dumont of Bruxelles badly restored the church from 1846: there is a splendid treasury of relics attached. The now parish church of the Beguinage, rebuilt 1289-94, modernised 1721, and suppressed 1792; S. John, founded 1390 and rebuilt 1770; chapel of S. James, founded *cir.* 1200, rebuilt 1660-62. The museum 1852 contains a small collection of Roman antiquities; the porte de Visé was erected 1379; there is also a town hall; palais de justice; and other public buildings. STAPPAERTS, *La Belgique Monumentale*, 8vo., Brux., 1840-44, ii, 272. WALTERS, *Belgique*, 8vo., Brux., 1846, p. 281. PERREAU, *Eglise Cath. de N. D.*, in *Mém. de l'Acad. d'Arch. de Belgique*, ii; *Suite des Recherches, plan, idem*, iii; *Tongres et ses Monuments, idem*, iii, iv, and v; and *Prom. Arch. dans la province du Limbourg, idem*, v. WEALE, *Belgium, etc.*, 8vo., London, 1859, p. 326. 28. 50. 96.

TONGS, PLIERS, or PINCERS. The tongs is the largest implement of the three, being used for screwing iron piping for gas, or other purposes. Rickards's is one of the many patents. MOXON, *Mechanick Exercises*, 4to., 1677, etc. NIPPERS. TOOLS.

TONGUE. (Fr. *languette*). The projection formed on the edge of a board to be inserted into the "groove" of another one. FEATHER TONGUEING. GROOVED (or ploughed) AND TONGUED BOARD. HE AND SHE JOINT. There are several patents, as the "Pavodilos", by S. Jennings. A board is also ploughed or grooved on both edges to receive a slip of wood (or hoop iron) to keep dust from passing through.

"Tongueing or rebating lower edge of a floor-board", BUILDING NEWS JOURNAL, 1877, xxxiii, 373. SANITARY RECORD, Oct. 15, 1885, p. 189. GWILT, *Encycl.*, edit. 1888, § 2023, 2104, 2171. 1.

TONGUE; see EGG AND ANCHOR molding.

TONNAGE. See TON.

TONNING. This term occurs in the Accounts of Wadham College, Oxford, 1610-13; the last entry, 26 Sept. 1612, has "for tonning of the chapple great window £1 10s. 0d. Also for tonning 51-4 window lights at 2d., £4 5s. 8d." BUILDER JOURNAL, 1850, viii, 374.

TONON, properly DUMOT; see THOMON (T.).

TOOFALL, or To-FALL, or LEAN-TO. A shed annexed to the wall of a larger one. A north country term; examples 1386 and later are given in GLOSSARY. 17.

TOOL. The implements used by each tradesman have been noticed *s. v.* the workman, as Bricklayer, etc.; also specially as regards some tools, *s. v.* Chisel, Plane, etc. The term also includes the numerous implements required by the engineer, and others—the manufacturers of which furnish illustrated and descriptive catalogues; also Farmers' tool-chests; Horticultural tools; and so on. The use of handicraft tools is coeval with the earliest periods of antiquity; the potter's wheel, axe, chisel, saw, drill, etc., attest the perfection to which the mechanical arts were carried by the Greeks and Romans. HOMER does not specify any other tool than the hatchet with two edges, the plane, the auger, and the rule. *Tools and Implements of Industry and Art*, in BUILDER JOURNAL, 1845, iii, 413. WILLIS, *History of Tools*, read at the SOCIETY OF ARTS, JOURNAL, 28th Jan. 1852; and printed in BUILDER JOURNAL, 1852, x, 247. RIGG, *The Material, Construction, Form, and Principles of Tools and Contrivances used in Handicraft*; in Cantor lectures at Society of Arts, 1875. 1. 2.

TOOLED FACE or **WORK** (Fr. *taille*, VIOLLET-LE-DUC, *Dict.*, s. v. Sculpture, 242). The surface of stone is dressed (PLAIN FACE); there are many ways of doing this, differing according to its hardness, and the custom of the locality; the terms also differ in different places. *Granite* has one kind of facing effected by punches, picks, and axes, then polished. *Freestone*, comprising the greater number of sand and lime-stones, has a "tooled face", effected by the pitching tool and mallet; and then worked by "points" and "punches" of iron, steel pointed, from a sharp point to about $\frac{1}{4}$ in. broad; by "chisels", having steel cutting edges $\frac{1}{4}$ in. broad and upwards, called the inch tool; by the "boaster", which is at least 2 ins. broad; and by the "broad tool" from 3 to 4 ins. broad, and other sizes, which tool in use is always kept perpendicular to the same side of the stone.

The first operation is to bring the face of the stone "out of winding", that is, bringing it to a level surface. In London it is done principally with "points" and finished with the inch tool. When this is done, the surface is "boasted" (called "droved" in Scotland, also "tooled face"), which is a regular description of chiseling in which the marks of the tool run in parallel lines of a certain width, forming channels and ridges, technically called "butts", each stroke being made in succession under the last, and over the whole length of the stone. "Tooled work" (sometimes called "stroked face") is similar, but each stroke is made by the side of the other, forming parallel lines extending across the whole breadth of the stone. This is more troublesome to do, as the surface must first be smoothed by the chisel. "Stroked work" or "striped work" is also similar to "tooling", except that the lines run at an angle of about 45° , instead of parallel to the edges of the stone.

"Fine tooling" is generally done with a $2\frac{1}{2}$ in. chisel kept very sharp; the broad butt is done with a $4\frac{1}{2}$ in. boaster, and is difficult to execute with regularity; they require three blows, one in, the second along, and the third out, which is done by lowering the chisel nearly flat. In London the squared stone used for facing buildings is usually "stroked, tooled, or rubbed". The tools for working the cylindrical and conical parts of moldings are of all sizes from $\frac{1}{8}$ in. upwards. Those for working convex moldings are not less than $\frac{1}{2}$ in. broad, except the space be too confined to admit of such breadth. **AXED WORK**. **BIT HAMMER**. **BRETTURE**. **BROACHED WORK**. **BROAD AXE**. **CHISELLED WORK**. 1.

"Tooled ashlar" showing strips of a narrow chisel, parallel to each other, is sometimes described as "broached in lines parallel to the beds not coarser than from 16 to — in a foot". If a still narrower tool be used, the work is *chiseled ashlar*; or "striped ashlar", or "droved and striped"; the stone being faced with the broad chisel; or is droved before being finished with the narrow chisel (from three-eighths to six-eighths of an inch in width). When all the tool-marks are obliterated by friction with another stone, it is "rubbed ashlar". "Ashlar fine tool dressed" and smooth on the face; or fine dressed, is "plain or plane ashlar", or "polished ashlar", the "*clene fayre achlere*" of the old English mason. The stone may be wrought with a "tooled narrow draught" forming a strip or margin round the edges or joints, and finished within it plain, or in various ways, as streaked, pointed, etc.

VIOLLET-LE-DUC, *Dict.*, s. v. Brettoir, explains that the faces of stone were plain until the middle of XII cent.—from 1150 to 1250 they were roughly indented—less so from 1300 to 1400—and became again plain in XVI cent. In the tomb vaults of the bull Apis at Sakkarah—the Serapeum—are the earliest tool-marks perhaps known; they are perfectly distinct; the surface of the cut rock looks like scales, the marks being made with a circular-ended chisel. The modern Arab work at Cairo to stone, shows a face, as sawn, with just the same appearance, in a rough way, as the delicate tooling anglewise known so well in Norman work, whilst the tool still used is the old claw-tooth, which gives the well-known XIII cent. tool-marks; this was a

surprise to mons. GANNEAU, as in his Palestine Exploration reports on mediæval masonry there. WIGLEY, in *ROY. INST. OF BRITISH ARCHITECTS*, 1855-56, p. t10; and LEWIS, *idem*, 1875-76, p. 33, 37.

TOOL HOUSE. A shed, or part of a shed, wherein a gardener keeps his tools, as rakes, hoes, barrows, etc. It is very often of wood painted, and erected against the back wall of a greenhouse. **POTTING SHED**.

TOOLING AWAY. A term used for giving a new surface to old work, in restorations; *BUILDER Journal*, 1865, xxiii, 432.

REGRATING. **STUNNING**.

TOOM. "1705-6. For clensing and tooming down the work on both sides the new building (of Clare hall, Cambridge), 5:10:0"; WILLIS and CLARK, *Arch. Hist.—Cambridge*, 4to., Cambridge, 1886, p. 110, which p. 622 suggests "coom, to remove dirt"; a comb or drag used for facing freestone (in this instance Weldon stone).

TOON WOOD, *Cedrela toona*. The red or moulmein cedar, of a light, soft wood, reddish brown in colour, impervious to the attacks of white ants. In Burmah and Bengal it grows to a height of 80 ft. or more. It is used extensively in Hindostan for furniture and cabinet work. Similar red wood is a native of New South Wales, Honduras, and Jamaica. *BUILDER Journal*, 1884, xlvii, 685. **RED WOOD**. 14.

TOORA, and **THORAH STONE**. A place on the opposite banks of the Nile to and near Cairo, in Egypt. At the Serapeion, the sides of the passage are laid with soft Thorah stone in courses 14 ins. high and 18 ins. thick; the chambers were also lined with the same stone. At the village of Sakkarah the treads or steps of a house had blocks of Thorah stone brought from the ruins of the adjoining tombs and pyramids; DONALDSON, *On Mariette's Excavations*, read at *ROY. INST. OF BRIT. ARCHTS.*, *Sessional Papers*, 28 Feb. 1861. The triangular casing blocks of the pyramids, a fine cream-coloured, magnesian limestone, was quarried at Toora and Masarah, on the opposite side of the river, and dragged down to the Nile; all but a few lower stones recently uncovered have been removed; a fragment in the British museum shows the original tooling of the joints; BRINDLEY, *idem*, 1888, iv, new series, 18. A. B. EDWARDS, *Up the Nile*, 4to., 1877, i, 55.

TOORBEH, Turbeh, and Kubbeh. Terms used in Hindostan and Egypt for a tomb.

TOORCH (RICHARD). See **TWRCH** (R.).

TOORUN. See **TORAN**.

TOOTH. The iron or steel point in a gauge which marks the stuff in its passage, or draws a line parallel to the arries of the piece of wood. The cutting edge of a saw has teeth.

TOOTHED MOLDING. See **DOG-TOOTH ORNAMENT**.

TOOTHING. A projecting piece of material, which is to be received into an adjoining work, as when the end of a brick wall is left with half-brick projecting and recessed to receive the other half-bricks when the work is continued, and so preserve the bonding, and keep the old and new works firm. **TUSSES**. 1. 4.

TOOTHING PLANE. The perpendicular iron is full of small grooves; if passed over a surface to scratch it a roughness is produced called tooth or key. This is done in veneering to the surface to be veneered as well as to the back of the veneer, and to hold the glue.

TOPARE. The present name of POLLANARRUA, in Ceylon.

TOP-BEAM. The same as collar-beam, strut-beam, and wind-beam, in MOXON, *Mechanick Exercises* (Carpentry), 4to., 1679, p. 147. 1. 2. 4.

TOPE or *tumulus*, or *stupa* strictly speaking; called *dagoba* in Ceylon, and *prachati* in Siam. When containing a relic chamber of Buddha, it was called *DAGOBA*, hence *pagoda*; in some cases, however, the relic was not placed in the *tope*, but in the *TEE* on its top. A *LAT* is the oldest and simplest form, being a single or monumental pillar, also called *STHAMB*. The *tope* or *stupa* was not endowed with a relic, but marked a sacred

spot, but writers do not keep strictly to the terms dagoba and tope. The form of the older topes is almost always that of a hemispherical or elliptic dome, on a low circular basement, or drum, and they always are, or rather were, surmounted by a square block or pedestal, which supported the *tee*, consisting of one, three, six, or nine circular discs, or state "umbrellas". In process of time many of the older dagobas, becoming more sacred or important, were added to, to increase their size; and this was done either by a concentric building enveloping the whole, or merely by giving it additional height on the same base; this is probably what gave rise to the more tower-like form which later structures assumed, as well as to the successive deposit of relics. The relic so enshrined may have been accessible by the priest; in many of the representations of dagobas sculptured at Sanchi, an opening is represented on the front. These buildings are still numerous in almost all countries where Buddhism now exists, while in India only a few are known; as at Sanchi, near Bilsah, erected between B.C. 250 and 100 A.D. One of the gateways (TORAN) is remarkable for exhibiting in relief on its uppermost lintel five small dagobas which are still objects of adoration. Nine or ten centuries later is found the only other dagoba in India—the one at Sarnath, near Benares—erected early in XI century. It is certain that there must be many others, but they have either perished, or exist in unexplored parts of the country; traces of them have been discovered. The most modern descendants of the *sthamba* are the nine-storied pagodas of China—the Mahometans, too, adopted this class of buildings, though they gave them a form of their own. These topes passed through many variations from the earlier form, which, both for *dagobas* and *sthpas*, seems to have been that of a low domical building surmounted by a small *tee*, altogether not exceeding its diameter in height; the tendency later was to heighten the dome and exaggerate the *tee*, till in the modern *sthamba* the dome is entirely omitted, and the *sthpas* consists merely of an exaggerated *tee*, while the dagoba is used as a monument or tomb, having taken the place of the simple tumulus in Ceylon, Tibet, and China, but even there it is always provided with an immense *tee*. FERGUSSON indirectly repudiates the doctrine that the principal part of all "Hindoo" temples (in the north of India), the *vimana* or great tower, always containing in its centre a square apartment called the *garbha griha* or "womb of the house", is merely a squared dagoba (*Pict. Illust.*, p. 16).

"In a *sohona* or Cingalese cemetery, may be perceived a variety of miniature dagobas: if the little earthen mound raised over the ashes of the dead be encircled with a row of stones, we see the origin of the projecting basement; if the tomb be that of a head man or high priest, we may find it cased with stone, and perhaps surrounded with a row of pillars: on all these is found a *devanara* branch planted, which, after taking root and shooting out its cluster of leaves, gives the semblance of the spire and its spreading termination, called *kob* by the Cingalese, and *tee* by the Siamese. In short the monumental tombs of Buddha's relics only differ in size, and in the durability of their materials." The following are the chief topes: "the gaudy Shoemadoo of Pegu, the elegant Toopharama dagoba of Anuradhapoora, the more modern masonry of Borobudor in Java, are but varieties of the same general form; and in the desolate caves of Karli, as in the gaudy excavations and busy scenes of Dambool, in Ceylon, there is still extant the sign of Buddha—the tomb of his relics:" all the dagobas at Anuradhapoora were built of brick, and incrustured with a preparation of lime, coconut-water, and the glutinous juice of a fruit which grows on a tree called by the natives *Paragala*; this preparation is of a pure white; it receives a polish nearly equal to marble, and is extremely durable: the *Ru van welli*—*sage* dagoba, the Miriswellya, the Toopharamaya, Lankaramaya, Abhayagiri tope, and Jaitawana ramaya tope, all vary from B.C. 140 to A.D. 275 or 310, and are of various heights, as 50 ft., 244 ft., 269 ft.; (FORBES, and FERGUSSON). The Bhilsa group; the example at Sanchi; Sarnath and Behar;

the Jarasandha Ka Baithak; Buddh Gaya; Amravati; Gandhara; Jelalabad group; Bimeran; Sultanpore; and Manikyala near Attok, with those at Thuparamaya; Sultanpore; Sonari; Anuradhapoora; near Cabul; Bhojpur; Andher; and in Afghanistan, are all described in FERGUSSON, *Indian, etc., Architecture*, 8vo., 1876. Portions of the actual rail from the Amravati tope are now fixed on the main staircase in the British museum. (*BUILDER Journal*, 1880, xxxix, 199.) SIMPSON, *Buddhist Architecture in the Jelalabad Valley*, read at ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1879-1880, p. 37-64, mentions several topes not in the above list.

LETRONNE, *Analyse de l'ouvrage sur les Stupa (Topes) de RITTER*, in "Journal des Savants", p. 542, 12mo., 1838. FORBES, *Eleven years in Ceylon*, 8vo., 1840, i, 220, describes Anuradhapoora, etc.; and *BUILDER Journal*, 1851, ix, 107. TURNOUR, *Mahawanso*, 4to., Ceylon, 1837. WILSON, *Ariana Antiqua; Antiq. of Afghanistan; and on Topes*, by Masson; 4to., 1841. FERGUSSON, *Pict. Illust.*, fol., 1847, p. 13. CUNNINGHAM, *Bhilsa Topes, or Buddhist Monuments of Central India*, 8vo., 1854; and *BUILDER Journal*, xx, 390. TENNENT, *Ceylon*, 3rd edit. 1859; *idem*, xviii, 55. FERGUSSON, *History of Architecture*, 8vo., 1865-67, ii, 461. FERGUSSON, *Amravati Tope on the banks of the Kistnah*, 8vo., Hertford, 1867. *BUILDER Journal*, 1880, xxxix, 199. FERGUSSON, *Tree and Serpent Worship; in I and IV cents. after Christ, from sculptures of the Topes at Sanchi and Amravati* 4to., 1868-9, and 46 pl.

TOPH STONE. See TUPA and TUFO.

TOPIARIO OPERE. A method of adorning a garden by cutting trees, or tops of small trees, into figures or forms, "vegetable sculpture" as it has been called. LELAND states, "At Ulself near Towton there lives a prebendary of York, possessed of a goodly orchard with walks *opere topiario*"; and in 1538 "the gardens within and the orchards without the mote of Wresehill castle", the ancient seat of the Percys, had "been exceedingly fair; and in the orchards were mounts *opere topiario* writhen about with degrees like turnings of cockle-shells to cum to the top without pain"; MASON, *English Garden*, 8vo., 1811 edit., p. 337, 395-7. The villa Pamphili Doria, at Rome, is a good specimen; it was a favourite system in Spain; and in Holland, where it is known as the "Dutch style." On a large scale it may be seen at Versailles; but the finest existing topiary work is at Elvaston castle; HARPER'S MONTHLY MAGAZINE, No. 370, March 1881; which illustrates some American examples. PRIVET.

TOPIARIUM OPUS. A wall painting representing shrubs, trees, and trellis work, as at Pompeii; LIBR. OF ENTERTAINING KNOWLEDGE, *Pompeii*, 8vo., 1832, ii, 163, 174, 198.

TOP RAIL. The highest horizontal piece in a framing, as of a door. DOOR, fig. A.

TOR. The Saxon term for a steep eminence, or a tower, and probably originally fortified. 2.

TORA. The Hindostanee term for stone brackets or corbels; KITTOE, *Indian Architecture*, fol., Calcutta, 1838, pl. 11. CHIRRIA and CURRIA are other terms.

TORALIS. "Arco toral", a principal arch. "Torale", a curtain or hanging. ARCUS.

TORALLS. "And he may make *toralls*, dovescotes, and a horse or handmill"; Liberties, etc., of Cardiff and Tewkesbury, granted by Robert and William, earls of Gloucester; in FOSBROKE, *Gloucestershire*, 4to., Glouc., 1807, ii, 283.

TORALVA (GONÇALVES DE), 1547, was architect of the cathedral at Miranda de Duoro. RACZYNSKI, *Les Arts en Portugal*, 8vo., Paris, 1846, p. 220. 68.

TORALVA (JACQUES DE), 1557, was master of the works at the monastery at Belem. RACZYNSKI, p. 220.

TORAN; Torun; Toorun. The term in Hindostan for a gateway to a sacred enclosure. FERGUSSON, *Indian, etc., Architecture*, 8vo., 1876, p. 95, describes those (four) at Sanchi near Bilsah, dating in the early part of the first century B.C., and one A.D. 10-28; each is 33 ft. high, the enclosure being 11 ft. high (a cast of one toran is now in the South Kensington museum); also at

Bijanagar; at Jaunpore, Gaur, Futtehpore Sikri; and at Pekin. GRINDLAY, *Scenery and Architecture on western side of India*, fol., 1826, s. v. Hindoo temple, end of ii. FERGUSON, *Pictorial Illustrations*, fol., 1847, p. 36. TOD, *Annals of Rajasthen*, 4to., 1829, i, 588; ii, 707, 710, 721, 745. "The torii, a temple of Yedo in Japan, is strikingly similar to the Indian toran though much simpler. The temple grounds are entered under a structure found before all Shintoo temples called a torii, composed of two upright posts of great thickness about 15 ft. high and placed 12 ft. apart; across the top is a wooden lintel, below which is another; they were originally of wood as at Kulanzaka, but when found before Buddhist temples, which is not unusual, they are of stone"; CONDER, in ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1878-79, p. 191-2.

TORBAY IRON PAINT. Wolston's paints from 1853 made at Brixham, Devonshire, have been much used in dockyards, etc., for coating materials under water, or in a position to be affected by damp. Their peculiar characteristics are, great covering properties, 62 lbs. effectually coating as large a surface as 112 lbs. of lead paint; economy, durability, protection of iron from corrosion, arresting oxidation at any stage, and resistance to sulphurous and other gases. It is a protoxide of iron, manufactured from a brown hematite iron ore, and contains about 64 per cent. of oxide of iron and 33 per cent. of siliceous matter. It ranges from a yellowish brown to black. Other colours should not be added, and to be pure it should not contain any sulphate of baryta. Calley's resists the fumes of sulphuretted hydrogen; does not blister, crack, or flake off, covers and preserves iron well. Hall's Torbay minium, or oxide of iron paint, ground in oil, both chocolate and plum colour; £1 per cwt. HUNT, *Handbook to the Official Catalogue of the Exhibition of 1851*, 12mo. (1851). BUILDER *Journal*, 1862, xx, 527. IRON PAINT. 1.

TORCELLO or Torzello. The parent island, in the lagoons of Venice, of the Venetian states; Roman remains are preserved in the museum; it was then occupied by the refugees from Altinum and Aquileia; also by others escaping the yoke of the Arian Lombards, with Paul, bishop of Attino, who removed his see here about 635. The city decayed in xi cent. The cathedral dedicated to Santa Maria was erected 641, of which the crypt (x cent., HOPE) only exists; it was restored or rebuilt 864; rebuilt 1008; the exterior modernised. The plan is a Latin one, probably copied from Parenzo of vi cent. The eastern apses with the arrangements in the chief apse are very peculiar; the mosaics on the walls and vaults are of xi cent.; the original reading-desk in the choir; the *pala* or altar-table of embossed silver of Greek workmanship; the opus Alexandrinum pavement; the windows closed outside by stone valves (SHUTTER) but now also glazed; the *benitier* (DALY, *Revue Générale*, 1856, xiv, 118); a narthex; and a square Lombard campanile (reduced one-third in height by lightning in 1640), detached, beyond the east end, are all of high interest. A plan is given in WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 301-7; and in ROYAL INST. OF BRIT. ARCHITECTS, *Transactions*, 1888, p. 155. The little church (former baptistery) of Sta. Fosca must have existed before 1011: its plan is Byzantine, a square of about 40 ft. formerly surmounted by a cupola; it was restored 1247, and later: on three sides is an arcaded vestibule. CIOGNARA, *Fabbriche di Venezia*, fol., Venice, 1838-40. It was copied by Scarpagino and Sansovino in their churches at Venice; GALLY KNIGHT, *Eccles. Arch. of Italy*, fol., 1842-4. The palazzo del commune is of xiii cent.; and near it is the "throne of Attila", perhaps the seat of inauguration of the chief magistrates. COSTADONI, *Osser. intorno alla chiesa Catt.*, 1750, in CALOGERA, *Opuscoli*, xliii, 255. CORNARO, *Ecd. Torcello Ant. Mon.*, 4to., Venice, 1749; and his *Not. Stor. delle Chiese e Mon. di Venezia di Torcello*, 4to., Pad., 1758. RUSKIN, *Stones of Venice*, 8vo., 1851-3, ii, 379. SELVATICO, *Venezia*, 8vo., Venice, 1847, p. 13, etc. HUBSCH, *Altchristlichen Kirchen*, fol., Carls., 1862-4. UGELLI, *Italia Sacra*, v, 1360. OLIPHANT, *The Makers*

of Venice, 8vo., 1888, p. 29, gives the throne and pulpit. MOTHES, *Bankwust and Bild. Venetians*, Leipzig, 1859. BATTAGLINI, *Tor.*, *Antica e Moderna*, Venice, 1871-74. ZULIAN, *Tor. e la sua Cattedrale*, Ven., 1889. *Illustrations*, "Bracket", 1858, pl. 41.

26. 28. 96.

TORCH. Among the Greeks, several fêtes were celebrated with torches. Upon ancient monuments they are sometimes seen almost twice the height of a man. They are generally conical, and apparently formed of several pieces bound together at certain distances, like the staves of a cask. They are placed flame downwards as symbolising the extinction of life.

TORCHER; TORCHIATOR. The mediæval Latin term for plasterer. "John Shiel torchiator" occurs in the accounts for building S. Stephen's chapel. BRAYLEY AND BRITTON, *Westm. Palace*, 8vo., 1836, p. 123. TURNER, *Domestic Arch.*, 8vo., 1851, i, xxvi, 25; which gives from the "London Assize" of 1189, mud plasterers, torchers (i.e., cobwallers); and p. 217, from the Liberate Roll, 32 Henry III, the order to make "a great and high *torcheacium* around the great kitchen"; can this mean a plasterer?

TORCHING. The pointing, or rendering, under tiles and slates with lime and hair mortar, to prevent snow drifting through joints, and to be effectual the under surface should be entirely covered. "Torged" is the word used in describing work in Northamptonshire, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1874, p. 227. TIERED. S. J. B.

TORCHIS. A French term for any kind of coarse mortar; as clay mixed with straw. *Mur de torchis* denotes a mud wall. COINTÉREUX, *Ecole d'Arch. Rurale*, 8vo., Paris, 1791, ii, p. 53-8. 19.

TORÉ. The same as TORUS.

TORÉIANI (HORATIO), or Torreggiano, of Rome; designed 1615 palazzo delli Pav. Monaci di S. Paolo Posto nella piazza di Sta. Maria Trastevere (pl. 38); and palazzo de' sig. Fonseca nel rione di Parione (six shops), (pl. 102) in FERRERIO AND FALDA, *Palazzi di Roma*, fol., Rome (1655).

TORELLI (GIACOMO), born 1608, at Fano, was the son of Pandolfo Torelli, a nobleman. He possessed a singular talent for theatrical architecture and scenic machines; and at Venice produced others with decorations; NOLFI, *Il Bellero Fonte*, *drama musicale*, fol., 1642. In France he designed others, and fireworks, and Louis XIV (1643-1715) appointed him royal architect and machinist. He designed and built the theatre at Paris called "Le petit Bourbon"; AMALTEO, *Machines, etc., apprêtées au noyau de Tetis, ballet royal*, fol., Paris, 1654. He 1662 returned to Fano, where 1671 he with others built the theatre della Fontana, or "La Fortunio", renowned for its size and elegance, MORELLI, *Imola*, fol., Rome, 1780; the scenes were arranged to be what they represented and not painted work: it was rebuilt 1874. (The theatre at Vienna was rebuilt 1690 after its design.) The king of France applied to Torelli for a design for a theatre at Versailles, and other works. He died 1 Oct. 1678 and was buried in the church of S. Pietro in valle de' Padri Filippini, at Fano. 3.

TORELS or Torrelli (HÉRCULES), 1694 planned the castello de la Mota, on the summit of Monte Argullo, at San Sebastian, in Spain. 66.

TOREUTON. The Greeks designated by the terms *τορευτων* and *γλυπτων* every work of art produced by the graver or other similar instrument. "Torismata", works chased and ornamented boldly in *rilievo*. "Toreutic", such works executed with high polish and engraving. 2. 6.

TORII or gateways; see TORAN; and TOPE.

TORINO (Lat. Augusta Taurinorum; Engl. and Fr. TURIN). The capital of Piedmont and of the states of Sardinia, in Northern Italy; and situated on the river Po. It is now (before 1846) dismantled, but the citadel exists, a pentagon constructed with great skill, built 1565 for Emanuele Filiberto, by l'acciotto of Urbino. The porta del Po is by C. G. Guarini. A bridge begun 1810 by (the French) Pertinchamp, eng-en-

chef; it has five elliptic arches each of about 80 ft. span; of granite from the quarry at Cumiana, which is hard and brittle. The suspension bridge erected 1840 is now decayed, and there are two other stone bridges of recent construction over the Po, one of five and the other of three arches. The bridge over the river Dora Riparia 1830-34 by chev. C. B. Mosca is of one arch, a segment of a circle, 147 ft. $7\frac{1}{8}$ in. span, with a versed sine of 18 ft. $\frac{1}{8}$ in., an arc of $54^{\circ} 56'$; the roadway is 40 ft. wide. It is all of the best Alpine granite from the quarry il Malanaggio, near Pinerolo; it cost with approaches £56,000. ALBANO, *Construction, etc.*, fol., London, 1836; ALLGEMEINE BAUZEITUNG, fol., 1836, pl. 36; and 1840, pl. 366; INST. OF CIVIL ENGINEERS, *Transactions*, 4to., 1842, i., 183-94. There are no vestiges of antiquity. The city is one of the most regularly built in Europe, and was begun to be reconstructed by Em. Filiberto (1553-1580), Carlo Emanuele II (1638-75), and Vittorio Amadeo II (1675-1730), C. Em. III (1730-73); whose chief architects were C. G. Guarini (1624-83), and F. Juvara or Juvara (1685-1735): the only exception to the rectangular planning is the magnificent arcaded street, via di Po, which cuts one quarter of the city diagonally, and was constructed 1675 by conte Amadée de Castellamonte. The houses are of brick, not plastered; many are erected on a continuous arcade. A pink syenite is obtained from Baveno. The porticos of the piazza Em. Filiberto (formerly delle Frette) 1716, are by F. Juvara. The piazza Vittoria Emanuele, laid out 1825, is of great extent. There are several good statues. The mont Cenis monument by the sculptor Belli (B. J., 1880, xxxviii, 199).

The cathedral, or duomo, dedicated to S. Giovanni Battista, was originally erected about 602; the present building dating 1491 or 1498 to 1505 has been attributed to Lazzari (Bramante), but it has been greatly altered and exhibits little similarity to the style which is usually attributed to him. At the eastern end is the circular chapel of the Sante Sudario, or cappella reale, completed in 1694, the master-piece of C. G. Guarini; it is built mainly of dark grey (called black) marble, and ascended to by a flight of steps on each side, of the same material; the cupola is formed by arched ribs on chords of the circle, and from the summit rise other ribs, forming a sort of latticed dome. CANINA, *Cat. S. Giov.*, 58 pl., 1843; reviewed in CIVIL ENGINEER, etc., *Journal*, vii, 171; CHAPUY and MORET, *Moyen Age Pitt.*, fol., Paris, 1837-40; LECLÈRE, pl. 25. Among the many other churches the following have been found mentioned:—

- Sant' Andrea united to La Consolata; one of the most ancient; burnt in x cent.; rebuilt of an oval form, 1675-1705 by C. G. Guarini;—1714 altar and alterations by F. Juvara.
Annunziata; its façade 1776 by F. Martinez of Messina.
La Basilica magistrale; cir. 1660-67 by F. Lanfranchi; octagon with cupola; the stone façade by cav. C. B. Mosca, cir. 1834.
S. Barbara; 1869 by Lanini.
S. Carlo Borromeo; 1619 by baron Valperga; circular; the scaffold for the dome is in KRAFFT, *Charpente*, fol., Paris, 1805, pl. 14.
Sta. Christina; 1639; façade 1718 by F. Juvara, his best work.
Corpus Domini; 1607 by A. Vittozzi; the interior 1753 by conte Alfieri is rich in marbles and gilding.
Sta. Croce; by F. Juvara; restored, perhaps after 1751 by G. Borra.
S. Domenico; founded 1214.
S. Filippo Neri; 1676 by C. G. Guarini (the finest church); the dome formed on ribs as at the chapel in the cathedral, failed in Oct. 1715, and the church was almost rebuilt by F. Juvara. Plan in LECLÈRE with part of interior side elevation, pl. 27.
Sta. Fosca; chapel of S. Giuseppe.
S. Francesco di Paolo; 1632 by P. Pellegrini (Tibaldi); the first left hand chapel, by F. Juvara.
Sta. Giulia; modern Gothic; 1867 by Ferranti.
S. Lorenzo (Theatine); 1634-56-87, by C. G. Guarini; dome formed on ribs.
Tempio della gran Madre di Dio; first stone July 23, 1818, finished 1820-30-40, by F. Buonsignore; the dome 74 ft. diam. and 100 ft. high; "a meagre imitation of the Pantheon at Rome"; cost about £100,000. ALLGEMEINE BAUZEITUNG, 1837, pl. 119, 124.
Sta. Maria della Consolata; x cent.; rebuilt 1679 by C. G. Guarini, is a combination of three churches opening into each other: the inner one by F. Juvara, s. v. S. Andrea, as above.
ARCH. PUB. SOC.

- SS. Martiri; 1577 by P. Tibaldi, for the Jesuits; the most sumptuous; high altar by F. Juvara.
S. Massimo; 1846 by C. Sada.
S. Maurizio; a fine cupola by F. Lanfranchi; façade 1846, by C. Mosca.
Padri dell' Oratorio; model by F. Juvara.
Sta. Pelagia; 1770, by cav. di Robillant.
SS. Pietro e Paolo; 1865 by Velasco.
S. Rocco; 1667, octagon with a good dome and lantern; and La Visitazione, 1661, both by F. Lanfranchi, with dome and cupola. Plans of both churches in LECLÈRE, pl. 25.
S. Salvatore; a large plan in LECLÈRE, pl. 31.
Sta. Teresa, 1632-74; façade 1764 by Aliberti; chapel of S. Giuseppe 1725 by F. Juvara.
La Trinità; 1607 by A. Vittozzi; dome 1661; 1718 embellished by F. Juvara.
B. Vergine del Carmine; by F. Juvara.
La Visitazione; 1661 by F. Lanfranchi.
The Protestant church of the Waldenses (Lombard), 1851-53, 90 ft. by 60 ft.; cost £6,000. ILLUSTRATED LONDON NEWS, xxiii, 593.
The Synagogue; 1864-69, by A. Antonelli of Novara; B. J., 1876, xxvii, 859 (not completed). A remarkable construction; now used as a museum.

The castle has two old towers; the façade in OSTEN, *Bauwerke in der Lombardie*, vii-xiv jahr., fol., Darms. (1846-54), who calls it "palazzo delle torri", 1031 by Manfred, marquis of Susa; the façade of the Corinthian order added 1416 by Amadeo VIII; the chief front 1720 is by Juvara: the building was 1718 fitted up as a palace for Madama reale, duchess of Savoia Nemours, and is now called palazzo Madama (LECLÈRE, pl. 22, gives court and staircases); on its northern tower is the observatory 1822. The palazzo reale, raised by Carlo Emanuele II from designs 1660 by conte Amadeo di Castellamonte, is of great magnitude but poor in design; enlarged by F. Juvara; 184... decorations by cav. P. Palagi, the royal architect. Connected with it are the *armoria reale*, formed 1834 chiefly from the arsenals of Genoa and Turin; the reali segretarie, or offices of the prefet; the uffizi; the archivi; academia militare, a large quadrangle of good effect; and the *teatro regio* 1738-39 by conte B. Alfieri; it is 83 ft. wide and holds 2,500 persons; ALFIERI, *Il nuovo teatro*, fol., Turin, 1761. The palazzo della reale academia delle scienze, was formerly the Jesuits' college or real collegio de' nobili, erected 1678 by C. G. Guarini, and on its institution 1783, was altered 1784-87 by ... Galliani; it contains 1867 the fine gallery of pictures, several museums, including the museo Egizio, purchased 1821 from B. Drovetti (died 9 ... 1852, aged 77). R. d'AZEGLIO, *Galleria reale di Torino*, 4 vols., fol., Turin, 1836-46. *Università reale*, 29 May 1713, by A. Ricca, an extensive and magnificent edifice. The parliament hall (ILLUSTRATED TIMES, Jan. 26, 1862, p. 199). The palazzo di città, 1683 by F. Lanfranchi, with a lofty and unfinished tower; (plan of courtyard and staircases in LECLÈRE, pl. 22; MICHELA, *Des. e disegni del pal. dei Magistrati supremi*, fol., Turin, 1841). The museo civico, founded 1863. The extensive arsenal for C. Emanuele II and III. The casa dei missionari and church, now palazzo arcivescovile, by F. Juvara. Pal. del seminario, 1725-29, by F. Juvara. Façade of the pal. del Senato (altered by Alfieri). The *Opere Pie* are numerous:—Ritiro delle Rosine 1740, and 1776, for over 350 inmates; Grande ospedale di S. Giovanni, founded xiv cent. for the infirm; hospital of S. Luigi Gonzaga 1794 for outdoor relief. The two barracks at the porta Susina, 1700 by F. Juvara, were considered then the best in Europe. The cattle market, in ALLGEMEINE BAUZEITUNG, 1875, pl. 90.

Pal. of prince Philibert of Savoy, by C. G. Guarini. Pal. Carignano 1680, by C. G. Guarini; a large court and façade 1864 by Bolatti and Ferri. Pal. Provana di Collegno, 1698 by C. G. Guarini; pal. Birago di Borghes or Borgaro, by C. G. Guarini, or F. Juvara. Pal. Benso di Cavour; pal. Spigno, and Paesana, all 1729 by ... Planterio. Façade to pal. Guarene, by F. Juvara. Pal. Martini di Cigala, is ascribed to F. Juvara. "Il Valentino", 1633 for Christina of France, wife of Vit. Amadeo, in the style of a French château, it is well preserved, and 1889 used as an engineering school; the subterraneous marble staircase

descending to the river Po, is effective. Pal. marquis Cambiano, formerly Priero. Pal. marquis de Prié. Pal. count Haratch, in contrada di S. Francesco d'Assisi. Pal. signor Lavarina, in contrada di S. Agostino. Pal. signor Deangelis, in piazza di S. Carlo. Pal. Graneri 1683 by Baroncelli. *Illustrations*, "Pedestal", from Pal. Barolo 1692 by Baroncelli. LECLÈRE gives, pl. 15, the vestibule and staircase of the pal. du marquis Solar Dubourg, place S. Carlo: pl. 22, the entrance and staircases to No. 21 rue S. Philippa, and to two other houses: pl. 104, entrance vestibule at the angle of a house; and a hall and staircase of another palace with an external colonnade; all elegant examples of planning. Possibly some of the above houses are now known by other names.

Besides the teatro regio already mentioned, are the teatro Carignano, restored after 1751 by G. Borra; rebuilt 1752 by conte B. I. di Alfieri for 1,300 spectators; burnt 1787 and exactly rebuilt by ... Feroggio; re-embellished 1845 with great magnificence (given in MORELLI, *Imola*, fol., Rome, 1780; ALLGEMEINE BAUZEITUNG, 1860, pl. 347; DUMONT, *Salles*, fol., Paris, 1774); the teatro d'Angennes; teatro nazionale 1848 by Courtial for 2,000; teatro Vittorio Emanuele, an amphitheatre 1856, for 4,500; teatro Rossini, 1793 by Oglioni, burnt and rebuilt 1828, for 800; teatro Scribe 1857 by Bollati for 1,400; teatro Gerbino 1838 for 2,000; teatro Balbo 1863 for 1,800; teatro Alfieri, 1855 by Panizza, burnt and rebuilt 1858, for 2,000; cirque Milan for 2,600, persons; with two for fantoccini.

In the vicinity (5 miles) is the basilica of "La Superga", the monument of the vow made 1706 by Vittorio Amadeo before the battle of Turin; on the summit of a hill about 2,200 ft. high; begun 1715 or 1717-31 by F. Juvara, circular with six elliptic chapels; contains in the crypt tombs of the royal founder and of the princes of the house of Savoy. The college has richly decorated marble halls and staircases. PAROLETTI, *Des. hist. de la bas. de Superga*, fol., Turin, 1808; LECLÈRE, pl. 100, gives plan of church and college. La Vigna della regina, now school for daughters of military officers, built 1650 by ... Viottoli, for card. Maurice of Savoy. Stupinigi (about 4 miles), an unfinished hunting lodge, built 1776 for C. Emanuele III by F. Juvara, with a splendid theatre by him; stabling, kennels, gallery, and orangery 600 ft. long. Castello di Aglie, country residence of C. Felice. La Veneria reale (8 miles), a residence of the king, contains a stud of 200 horses, and riding school cir. 1750 by B. I. Alfieri, or by F. Juvara. Other palaces at Moncalieri (5 miles), and Rivoli (10 miles). Capuchin church and convent Del Monte.

14. 28. 50. 96.

CANCELLIERI, *Notizie sulle campane e campanili*, the torre pulled down by the French. SUZZARA, *Memoria di due Monumenti*, Milan, 1842. TENIVELLI, *Biografia de' Piemontesi illustri*, 1780. BERTOLOTI, *Descrizione di Tor.*, 8vo., Tor., 1840. BERTINI, *Torino*, 8vo., 1852. CIBRARIO E PROMIS, *Storia di T.*, 1836; 1840. STEFANI E MONDO, *Torino e suoi dintorni*, 8vo., 1852. BARICCO, *Torino descritta*, 8vo., 18... MEIRANESIO, TESAURO, FERRERO E GIROLDI, *Istoria di T.*, 1679-1712. COVINO, *Aleune ore in T.*, 8vo., 1880. MILANESIO, *Cenni Storici sulla città e cattedrale di T.*, 1826. ROCCA, *Guida di T.*, 8vo., 18... POMDA, *Desc. di Torino*, 8vo., 1840. PAROLETTI, *Turin et ses curiosités*, 8vo., 1819. RICOLVI AND RIVAUTELLA, *Marmora Taurinensis Illustrata*, or *Monumens de T.*, 4to., 1743-47. GUARINI, *Architettura Civile*, 80 pl., fol., 1737; and *Disegni d'Architettura* (engraved 1680), fol., Turin, 1686. BUILDER *Journal*, "Going Along", 1864, xxii, 37. CALLET ET LESEUER, *Architecture Italienne*, fol., Paris, 1827. TAPPEN, *Observations on the Arch.*, etc., in *France and Italy*, 8vo., 1806, p. 312. LECLÈRE, *Recueil d'Architecture*, fol., Paris, 1826; giving, as quoted, plans drawn by his pupils "Leblond, Secretan, Chatenaf, Morey, Abrie for Debret, and Armand". Map No. 208 of the Society for the Diffusion of Useful Knowledge. (Sarasin) *Guida della città di Tor.*, 12mo., Tor., 1870.

TORMONE RED GRANITE. Near Ross of Mull; see GRANITE (75).

TORNERO (JUAN), 1512 Sept. 3, with Juan de Orozco, and Rodrigo de Saravia, were commissioned with others to consult as to the site for and erection of the new cathedral at Salamanca. The documents are given in LLAGUNO, i, 293, and translated in STREET, *Gothic Arch. in Spain*, 8vo., London, 1865. 66.

TORONTO, known as Little York when founded 1793 and burnt 1813; created a city in 1834; since 1867 the permanent capital of the province of Ontario, Upper Canada. It is situated on lake Ontario. The Queen's park contains over 35 acres. There are over 80 churches. The Anglican cathedral of S. James, 1849-52, early English Gothic, by F. W. Cumberland, for 2,000 persons; with tower and spire 316 ft. high, erecting 1875, cost \$220,000. Roman Catholic cathedral of S. Michael (Decorated Gothic). Scotch church of S. Andrew, \$80,000. The Methodist church, \$100,000. S. James, 1849. Knox church, 1847-8. S. Paul, 1858, by G. K. and E. Radford (B. J., xvi, 279). S. Stephen, burnt 1865, built at sole expense of R. B. Denison. Others are mentioned in B. J., xiii, 530; and xiv, 564; about 30 up to 1856. S. James's cemetery chapel, 1857, by Cumberland and Storm. The university, the pride of the city, 1857-9 (Norman), by Cumberland and Storm, on 100 acres, costing \$900,000 (or £80,000); (B. J., xvii, 607; 782: B. N. J., 1858, iv, 1076). Normal and model schools for teachers, 1851-60, by Cumberland and Ridout; plans in DUBLIN BUILDER *Journal*, 1860, ii, 252; its grammar school, built north of it, 1857, by Cumberland and Storm, cost £5,000. John street school 1853-4. Trinity College 1852 by Kivas Tully, after that at Cambridge. Knox's college. Roman Catholic college of S. Michael. Upper Canada college 1830 by J. G. Chewitt.

Buildings adapted 1855 by Mr. Hay for the parliament: new parliament houses 1885 to cost \$750,000. Government house, enlarged 1855 (B. J., xiii, 530). Osgoode hall, or law courts (Greek), 1829-32; additions 1857, by Cumberland and Storm (B. J., xv, 395), rebuilding the central portion and adding in the rear cost £28,000. The exchange 1855. City hall 1845. Post office 1852. Custom-house. Rossin-house, 1856, by W. Kauffman. S. Lawrence hall, 1850, by W. Thomas and Sons (ARCHT., ii, 437), 140 ft. by 75 ft. Observatory. Provincial lunatic asylum 1845-50 by John G. Howard. New general hospital 1856. Central prison, \$500,000. Palace of Industry 1858, by Fleming and Schrieber (B. N. J., iv, 1052), 256 ft. by 144 ft. Grand opera house; and Royal opera house, each holds over 1,500 persons. Nordheimer's music and masonic hall, 1857-8, by Wm. Kauffman, 102 ft. by 75 ft., cost \$17,000. Mechanics' institute 1847-55 by Cumberland and Storm, 80 ft. by 140 ft. Sherbourne house, 1857, for T. G. Ridout, is one of the largest. New "Globe" office, 1864, by W. Kauffman (B. J., xxii, 950). Tomb of J. G. Howard, architect, in High park (B. J., 1880, xxxix, 483). The Brock monument 185 ft. high, on Queenston Heights, Western Canada, near the city, was rebuilt 1854 by William Thomas, after injuries done 17 April 1840. The pictorial supplement of the "Globe" for January 1857 gives a good account of the edifices. BUILDING NEWS *Journal*, 1856, ii, 587, has a long description; also iv, 845. ILLUSTRATED LONDON NEWS, 1847, x, 68, two views. RIPLEY AND DANA, *New American Cyclopaedia*, 8vo., New York, 1861-76. *Views of Tor. with Descr.*, 8vo. (London, 1859). NELSON, *Handbook*.

TORRE (NAPOLEONE DELLA), 1564, designed the palazzo della Città, at Milan.

TORRE (GREGORIO DE LA), of America, completed the works at the cathedral at Mérida in Yucatan, commenced after 1585 by J. M. de Agüero. 66.

TORRE (PEDRO DE LA), 1632 with F. Bautista, recommenced the capella del Ochavo, at Toledo cathedral. With JUAN residing at Madrid, he was 1647 concerned in many works; and with F. Bautista and Juan de la Pedrosa in those of the ochavo. In 1654 he designed the model for the libros y papeles del archivo, in the same cathedral. 66.

TORRE (JUAN DE LA), 1593, aparejador at the works at the Habana. 6.

TORREGGIANO (ALFONSO), was born in Bologna, where he designed the following edifices. After 1703, palazzo Monti (later Caprara, and 1826 Beauharnois); the staircase by A. Laghi; interior by C. F. Dotti. 1727 the fine church of S. Ignazio dei Gesuiti (the church of the Noviciates); its college now the accademia delle Belle Arti. 1746 collegio of S. Spirito; the church by G. Jarmorini. 1748-51 the façade and two large chapels next the entrance for pope Benedict XIV (1740-58), at the cathedral of S. Pietro (begun 1605 by G. A. Magenta). 1753, restored the cappella ... (designed by G. B. Falcetta) in the church of S. Martino maggiore, for the marquis Conti Castelli. 1756, altered and raised the church of S. Prospero (built 1749). 1757, designed the buildings now the Monte di pietà, with his son ANTONIO, who died 1748. About 1760, the interior and magnificent Oratory in the church of Madonna di Galliera. The parish church of Sta. Maria Maddalena, carried out 1772 by R. Compagnini. Also a chapel in S. Procolo: a large staircase near the sacristy of the monastery attached to S. Giacomo maggiore: the cappella Lombardi Malvezzi in the church of S. Francesco; with the palazzo Dondini (later Rusconi); and the palazzo, now the college di S. Luigi, founded 1645 by count Carlo Zani. He died 1764. 5. 30. 94. 105.

TORREGGIANO (HORATIO); see TOREANI (H.).

TORREGGIANO (PIETRO). A sculptor and worker in terracotta, born about 1470 at Florence, placed under the sculptor Bertoldo, the then teacher of the duke's school. Certain merchants are stated to have sent him to England (about 1506 or soon after). King Henry VII in his will made 1509 describes the Gothic screen, closure, or grating as then being executed to his tomb to be of gilt brass and copper; the artists are unknown, but were probably Englishmen. A design for a tomb for king Henry VII (died April 21, 1509) and his queen Elizabeth (died 11 Feb. 1503) was made 1506 by "master Pageny"; (WIDMORE, *History of Westminster Abbey*, 4to., 1751, p. 120; drawing in Brit. Mus., Cotton.; indenture, *idem*, Harl. MS. 297; NEALE AND BRAYLEY, *Westminster Abbey*, 4to., 1818-23, i, 55, pt. 2). This design was discarded for one made by Torreggiano, who then lived within the precincts of the abbey, who contracted 26 Oct. 1512 to make the tomb by Nov. 1, 1519, for £1,500, and completed it about 1516; STOWE says 1519; (ACKERMANN, *Westm. Abbey*, fol., 1812, ii, 140-3; NEALE, i, pt. 2, p. 54-9; CARTER, *Ancient Sculpture*, fol., 1792, i, 31-33, gives the six panels; COTTINGHAM, *Henry VII Chapel*, fol., 1822-9.) On March 11, 1516, he agreed to make "a garnishment, an awter, and various ymages" at the head of the said tomb, before Nov. 1, 1519, for £1,000, which appears to have been the highly decorated "touchstone altar all of one piece with its excellent workmanship of brass" (NEALE, i, pt. 2, 58; the altar itself shown in SANDFORD, *Genealogical History*, fol., 1707, p. 496; it was destroyed 1643; the portion discovered 1866-69 is described in STANLEY, *Memoirs*, 8vo., 1869, p. 504; 671-2). Torreggiano about 1517 saw B. Cellini in Italy when the latter was about 17 years of age, and tried to induce him to go to England and work there with him. On 5 January 1518 "Petir Torrysany of Florence, graver" proposed to contract for making a tomb within four years for Henry VIII and Katherine, to be one-fourth larger than the other, for £2,000 (ARCHEOLOGIA, 1812, xvi, 84; and NEALE, i, 54). In 1518 also, he attended as a witness before the Council at Greenwich; (*Records of the Court of Requests made by Henry VII*, 4to., 1592, p. 60; VERTUE in WALPOLE, *Anecdotes*, edit. 1862, i, 102. WYATT, in paper named below).

Other works attributed to Torreggiano are: by VERTUE (in WALPOLE, i, 104), the tomb to John Young, D.L.L. (died 1517, but 1516 on the tomb), master of the Rolls, in the Rolls chapel, Fetter lane; as possibly by B. da Rovizzano; and by WYATT, *Foreign Artists in England*, read at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1867-68, p. 220, who gives a good sketch of it (PENNANT, *London, etc.*, 4to., 1790, p. 174). WALPOLE also states that there is a head of Henry VIII in plaster in a round at Hampton Court perhaps by him; and CARTER, *Ancient Sculpture*, etc., fol., 1792, p. 44, gives the model of the head of Henry VII, formerly 1788 at Strawberry hill. Also the tomb in Westminster abbey to Margaret Beaufort, countess of Richmond (died June 29, 1509), which tomb is supposed by W. Burges to have been done earlier than that for Henry VII (SCOTT, *Gleanings*, 8vo., 1863, p. 83; TARVER, *English Monuments*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1883-4, p. 40, and plate). The chantry chapel in Christ Church priory church, Hampshire, to Margaret Pole, countess of Salisbury (died 1541), has the same "arabesque ornamentation of the figures and pilasters as on the tomb of king Henry VII"; FERREY, *idem*, *Sessional Papers*, 1864, p. 140; the tomb is also ascribed to the date of 1530-41. Pietro went about 1519 to Spain where he died in 1522, aged 49.

To Torreggiano has been ascribed the designs for the vaulting in bishop West's chapel, Ely cathedral, 1515-33; the oak rood-screen, carved 1531-36 supposed by Italian workmen, in King's College chapel, Cambridge; and other works; (EDINBURGH REVIEW, vol. 164, 1837, iv, 87). FOSBROOKE, *Gloucestershire*, 4to., 1807, i, 180, mentions the carving under the stalls of Henry VII's chapel as by Torreggiano. It may be noticed that B. da ROVEZZANO, a Florentine, was employed 1515-22 or 1524-29 to make a tomb for cardinal Wolsey (perhaps from the model in wood and figures in wax made by B. Bandinelli, for the king according to VASARI, *Lives*, edit. 1851, iv, 243); to be completed for Henry VIII and Jane Seymour (she died 1537) which was nearly finished 1546; and destroyed 1646. 19.

TORRES (PEDRO DE), with Juan de Bobadilla, of Palencia, 1577-1604 completed the higher cloisters of the Benedictines de S. Zoil de Carrion de los Condes. 66.

TORRI (GIAMBATTISTA), was architect to the Senate of Bologna. 1688-9 he entirely remodelled the church (rebuilt 1478) of Madonna di Galliera; and with his son Giuseppe Antonio designed the collegio Ungarico (now the Venturoli college of architecture); it was completed 1700 by G. A. Conti; also the Augustinian church of S. Elena; the campanile by G. A. Conti. He died 1697. 94.

TORRI (GIUSEPPE ANTONIO), son of GIAMBATTISTA, succeeded 30 March 1697 as architect to the senate of Bologna. He 1703 rebuilt the parish church of S. Tommaso dal Mercato, carried out by G. A. Taruffi. He designed 1710 the machinery (*trafila*) connected with the mint; the observatory to the university; 1700 the church of S. Gabriele; completed 1720 the church of SS. Trinità, begun 1662 by F. Martini; designed the palazzo for William III of England (later Belloni and Sora Munarini; the further court and handsome staircase to the palazzo Ruini (later Ranuzzi and Baciocchi); pal. Scarani; palazzo Isolani de S. Stefano (LANDI, *Pal. di Bologna*, fol., 16..., pl. 12); and modernised 1676-1730 the palazzo Pepoli, built 1344 (LANDI, pl. 10). He died 1713, aged 58. *Bologna, Pitt., Scult. ed Archit.*, 12mo., Bol., 1732. 94.

TORRI (GIULIO), 1602 rebuilt the fine church of Sta. Cristina, at Bologna. 94. 105.

TORRIGLIA (A...), with three others designed 1655-60 the albergo dei poveri, at Genoa; GAUTHIER, *Les plus beaux edifices*, fol., Paris, 1830, i, 47-9, pl. 46. GENOA.

TORRYSANY (PIETRO); see TORREGGIANO (P.).

TORSEL, tossel, tossle. See TASSEL.

TORSION or twisting strain. That force with which a thread or wire returns to a state of rest when it has been twisted by being turned round on its axis. In general the strength of a cylinder or solid axle by which it resists being wrenched asunder by twisting is as the cube of its diameter; thus if a solid cylinder be double the diameter of another, it would require eight times the force to wrench it asunder; BUCHANAN, *Millwork*, 8vo., 1841, p. 231-49. *Resistance of Square Bars to Torsion*, by ST. VENANT, in MÉMOIRES DES SAVANS ÉTRANGERS, xiv, about, 1856; as described by RANKINE, in CIVIL ENGINEER, ETC., *Journal*, 1862, xxv, 85. *Resistance to Torsion*, in HODGKINSON, *Cast Iron*, 8vo., 1846, p. 495. *Resistance of Woods to Torsional Strain*, by

Thurston, in *Journal of the Franklin Institute*, describing an apparatus for determining this torsional resistance and the results obtained by different experiments. By suitable mechanism, the force producing torsion is transmitted through the test piece and moves a pencil which traces upon paper a curve, the ordinates of which are proportional to the torsional moment, while its abscissus represents the amount of torsion to which the specimen has been subjected, thus indicating the relative stiffness. Torsion of BRICKWORK (p. 146).

TORSO. A term applied to columns the shafts of which are twisted; of which there are several varieties, as the fluted or channeled; the cabled or indented; etc. They are found in mediæval and in renaissance art. 1. 2. 6. 25.

TORTOISE or sphinx; seen peeping from the bases of columns, are mentioned by CORDERO, *Dell' Italiana Architettura*, 8vo., Brescia, 1829, p. 149, as marks of works executed in XI and XII centuries; as named s. v. LION (p. 104). In China, one species of memorial is a stone slab, called *shepae*, about 8 ft. high, 2 ft. broad, and 6 ins. thick, covered with inscriptions recording some honour conferred by the emperor, or the merit of some person. These slabs are always fixed upright on the mystical figure of a tortoise, and of the same stone from which the slab is cut; *Detached Essays*, Chinese Architecture, p. 13. The fontana delle tartarughe, at Rome, is so called from the four tortoises which ornament it; it was designed by G. della Porta. 14.

TORTOISE-SHELL. The best is obtained from the Testudo imbricata, or Hawk's bill turtle. HOLTZAPFFEL, *Turning and Mechanical Manipulation*, 8vo., 1843, i, 126-135, gives a full account of its conversion into articles. AIKIN, *Horn and Tortoise-shell*, in *Transactions of Society of Arts*, vol. lii, pt. 2, p. 343-7; he refers to the furniture in the times of the Romans and Augustan age. Tortoise-shell painting, an original specimen, *cir.* 1672, exists at a brick house in South Shorbury, Essex. 14.

TORTOISE, or TESTUDO. A sort of covered gallery, or fence made of boards covered with raw hides, under which, as a pent-house, the besiegers of a town in the ancient and mediæval periods got up close to the walls. VITRUVIUS, x, c. 19, 20, 21.

TORTOISE WOOD. See GUETTARDA.

TORTONA (Rom. Dertona). In the States of Sardinia; one of the most ancient cities of Northern Italy; situated about half-a-mile beyond the right bank of the river Scrivia. The citadel was blown up 1796 by the French. It is the see of a bishop. The duomo, dedicated to the Assumption of the Virgin, built 1554, is not remarkable; UGHELLI, *Italia Sacra*, iv, 623. In the church of S. Francesco is the rich chapel of the Garofali family; the three other parish churches; and a royal college, are worth notice. 28. 50. 96.

TORTOSA (Gr. ANTARADUS; Roman Tartûs (formerly said to be Orthosia). A village on the coast of Syria. The castle is most interesting and shows its Phœnician origin in the huge bevelled stones; it stands on a rock in the sea; on the land side is a moat, a wall, another moat, and another wall, the outer one still 60 ft. high in one place; in MAUNDRELL's days, 1697, there was a drawbridge. Between the moat and courtyard is a hall 155 ft. by 66 ft., its vault supported by five granite columns; near it a chapel, both attributed to the Crusaders. The cathedral is dedicated to, it is 130 ft. long and 93 ft. wide, with nave and aisles divided by pillars; roofless; it is a fine work of the time of the Crusaders. The French explorations are described by RENAN in the *Moniteur* for 1862. MIGNOT, *Mémoires sur les Phéniciens*. 23. 50.

TORTOSA (Anc. Dertosa; Roman, Julia Augusta Dertosa). A town of Cataluña, in Spain, situated on the river Ebro. It is the see of a bishop. The cathedral (Gothic) dedicated to the Virgin Maria de Stella, and dating 1158-78, was erected on the site of a mosque built 914 by Abd-ur-rahman. It was rebuilt from 1347: in 1416 P. de Julbe or Xulbe was *maestro mayor*; his son JUAN conducted the works for him. The façade is Ionic, and additions in the interior: the eastern apse has the *coro* around the high altar: the *silleria* 1588-93, by C. de Sala-

manca: the cloisters have Ionic and Doric columns, perhaps erected 1593, the date given to the cathedral in some works. The *colegio*, founded 1632 was improved 1528 and 1545. LA-BORDE, *L'Espagne*, fol., Paris, 1806.

About three miles distant are the quarries of the valuable and handsome marble called Tortosa jasper, and known in Italy as "broccatello di Spagna"; the churches in Rome are largely decorated with it, but only two columns. The finest monoliths in Spain are at Zamora and Zaragoza, where the pilar de la Virgen is of the same marble. It is formed chiefly of small yellowish marine animals thickly embedded in purple or violet clay. 14. 23. 28. 50. 66. 96.

TORTOSA. An island on the coast of Lycia. SOCIETY OF DILETTANTI, *Antiquities of Ionia*, fol., ii, 1797, contains, at the end of the copy at the British museum, two plates showing the Mole and island; and the sepulchre near the village.

TORUN; or gateway, in India. See TORAN.

TORUS and (Old Engl.) TORE. A bold convex moulding occurring in the base of a column of the Roman and renaissance periods of architecture. It is larger than a bead or astragal. In form it corresponds with the BOLTEL moulding used in Pointed architecture. A similar molding, but more refined in outline, is used in Greek architecture. 1. 19. 25.

TOSCANELLA (Anc. Tuscania). A city of southern Etruria, near Tarquinium. A site of considerable interest; there are no vestiges of the ancient town, but its necropolis; the "grota della regina" with its labyrinth, the columbaria, and other subterranean tombs, partly opened by the Campanari family, have yielded great treasures; their house and garden with its unique arrangement of recovered works of art are of great interest; many were brought to England and purchased for the British museum. The mediæval battlemented walls and towers exist, and a few other remains of the time of Francesco Sforza. It was ruined by Charles VIII of France (1483-98). The cathedral dedicated to S. Pietro (earliest specimen of Italian Gothic) built IX or X cent. with ancient materials. It is considered "a gem"; a crypt under the altar was perhaps a Roman bath formed on an Etruscan temple; a good rose-window is given in DALY, *Revue Générale*, 1856, xiv, pl. 2, 3. The church of Sta. Maria is less rich but more grotesque, and perhaps a century older. Its pulpit is like that in Sta. Maria di Castello, at Corneto, dating about 1206; GAILHABAUD, *Monumens*, 4to., Paris, 1842-52; round window in ROSENGARTEN, *Architekt. stylarten*, 8vo., Bruns., 1857, p. 197; ciborium, in DALY, i, 3; pulpit, i, 53; window, i, 63. DENNIS, *Etruria*, 8vo., 1878, i. 23. 28. 50. 96.

TOSH NAILING, also tush nailing, and skew or secret nailing. A method of fixing boards or framing, by driving nails in a diagonal direction, with the aid of a punch, through the edge of woodwork instead of through the face; this is a general method of fixing work that is not to be painted. If the boards forming an oak floor be matched, and tosh-nailed through the lower edge of the groove, no nails are visible; dowelled floors are tosh-nailed to the joists. FLOOR BOARD. The patent "pavodilos" is a modern method of secret nailing.

TOTARRA WOOD; Podocarpus totarra. A wood of New Zealand, is said to surpass any mahogany seen, it having a great variety of grain and a beautiful mottled appearance; it takes an excellent polish; can be cut into veneers of any size, and secured on mahogany in the usual way. The trees grow to 12 ft. diam. It is not much harder than limewood. Handsome furniture has been made of it. BUILDER *Journal*, 1846, iv, 446.

TOTE. The handle to a fore or other plane. The rebate planes have not any. MOXON, *Mechanick Exercises* (Joinery), 4to., 1678; 1701, 3rd edit., 61, 113. 1.

TOTO DELL' NUNZIATA (ANTONIO). An artist of Italy, who arrived in England and is recorded 1530 as having sold "tables" or pictures to the king; LAW, *Hampton Court*, 8vo., 1885, i, 129; and 1551 was paid for painting the banqueting-house set up in Hyde park, for the marshal S. Andrew (ARCHÆOLOGIA, 1817, xviii, 324). His letters of naturalisation, 30 Henry

VIII, 22 June 1538, are given in RYMER, *Fodera*, xiv, 495 margin. WALPOLE, *Anecdotes*, edit. 1862, i, 61, gives several references to his artistic works, and notices that Toto "entered the service of the king for whom he executed numerous works; some of which were in architecture, more especially the principal palace of that monarch, by whom he was largely remunerated." This palace was most probably "Nonsuch", erected about 1538-9 and is described in ARCHÆOLOGIA, 1863, xxxix, pt. 1, 33-8, by Scharf. But it was so thoroughly the Gothic of Henry VII, that probably only the plaster-decorations were done by Toto. BRAYLEY, *Survey*, 4to., iv, 408; NICHOLLS, in GENTLEMAN'S MAGAZINE, August, 1837. VASARI, *Lives*, 8vo. edit, 1852, iv, 79; v, 5, 12. WYATT, *Foreign Artists in England*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1867-68, p. 225. It is not clear in what year he died, but after 1552 when he left England.

TOTTERNHOE STONE. A quarry near Dunstable in Bedfordshire, supplying a soft, fine-grained stone, of the lower chalk formation. It was used at Dunstable priory (the nave and aisles were retrofitted under Somers Clarke, during 1880); at Woburn abbey under Flitcroft; at Luton; and at many churches; the upper range of the nave of S. Alban's cathedral; S. Cuthbert's screen, *cir.* 1097-1119; and the richly carved altar screens, shrines, and chapels. It contains 30 per cent. of clay, and fails where exposed to the weather. Gayfere's report 1808 on Bath and Totternhoe stones, is given in COTTINGHAM, *Henry VII's Chapel*, fol. 1822, p. 10-1. ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 4to., 1842, p. 143. HANMER, *Letter describing the Tott. stone*, in *Annals of Philos.*, xvi, 1820, p. 59. In Buckinghamshire also, there are generally two layers of rather brownish sandy chalk, hard, with dark grains of small brown nodules. WHITAKER, *The Chalk of Buckinghamshire, etc.*, in GEOLOGICAL SOCIETY, *Quarterly Journal*, xxi, 1865, p. 398.

TOUCH or TOUCHE STONE (Fr. *pierre de touche*; It. *paragone*). A compact dark-coloured stone, such as Purbeck or Petworth, and receiving a high polish. "Black touchstone" of some writers. "Lydius lapis, shining as glass," is quoted in NOTES AND QUERIES *Journal*, 1869, 4 Ser., iv, 77. Lapis Lydius (or lapis Hibernicus, of DE BOOT, 1647), is the true touchstone for gold of the ancients; it is an impure flint of the carboniferous limestone of Ireland. WILDE, *Cat. of Antiq. in Royal Irish Academy*, 8vo., Dublin, 1857, p. 11, 49, 62, 67, 89, 125, with cuts of some of the touchstones found. It is called "Lyidian stone", in HOLINSHED, *Chronicles of England*, fol., 1587, b. iii, c. 9. It is also described as a flinty slate; and as a very finely grained black sandstone. It is the name of the material used in the screen and tomb of Edward IV (died 1483) at Windsor; POTE, *History*, 4to., Eton, 1749, p. 359; SANDFORD, *Genealogy*, fol., 1707, p. 413: as part of the tomb of king Henry VIII; SPEED, *Historie*, fol., 1652, p. 1037-8; NEALE, *Westm. Abbey*, i, 54; of king Henry VII, in ACKERMANN, *Westm. Abbey*, 1812, ii, 136; of king Sebert, *idem*, ii, 126; and of Aveline, countess of Lancaster, *idem*, ii, 214. The altar before the tomb of Henry VII was of one piece of touchstone, broken down 1643, by sir R. Harlow; MERCURIUS RUSTICUS, 214, quoted in WILSON (or HOLE), *Ornaments of Churches*, 4to., 1761, App. 12. The tomb of sir James Bromley, died 1587, has "pillars of Lydian marble gilt"; that of "black touchstone" to Francis lord Cottington and his lady, he died 1652 and she 1633; *London and its Environs described*, 8vo., 1761, i, 32-3.

"Touchstone basalt", or *pietra di paragone*, is properly basanite (PARAGONE MARBLE, from Bergamo). VASARI, *Lives*, 8vo., edit. 1851, iii, 131-2, s. v. B. da Rovezzano, mentions the tomb 1512 to Piero Soderini, in the principal chapel of the Carmine, at Florence, as of this material. BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 262.

TOUFFA. A gardener's shed; ARCHÆOLOGIA, 1814, xvii, 161.

TOUGHENED GLASS. Glass heated to a cherry redness and then suddenly plunged into oil, causes its toughness to be greatly increased, while its transparency remains the same.

ARCH. PUB. SOC.

The originator 1874-75 was F. de la Bastie, of France; and a company was formed at Manchester 1877 for the manufacture of it. It was chiefly used for domestic purposes; articles of toughened glass being subject to spontaneous rupture may have had something to do with the neglect of the manufacture.

TOUGHENED IRON; see STIRLING'S PATENT IRON.

TOUL (Anc. Tallo). A town in the department Meurthe, situated on the river Moselle, over which is a bridge of seven arches. The Roman amphitheatre is nearly destroyed. The cathedral, dedicated to Notre Dame and S. Etienne, was built for S. Mansuy or Mansueto, about 335. The east end was erected *temp.* Louis IX (1226-70) in a plain type of Lorraine Gothic: P. Perrat (died 1400) was working there. The west front, fine portal, and twin towers 227 or 245 ft. high, designed by Tristan (who died after 1460, LANCE, *Dict. Biog.*), is also 1447-50-96 attributed to Jacquemin de Commercy (who may be the Jacq. Ogier, at work there 1440); these parts are surpassed by few in France. The building has been restored; it is 289 ft. by 118 ft. inside, and the nave 85 or 89 ft. high; it has no triforium; LA BORDE, *Monumens de France*, fol., 1836, pl. 200. The east end, and details of cloisters are given in SHAW, *Arch. Sketches*, fol., 1858, pl. 39 and 40. The collegiate church of S. Gengoult, dating from 814, has a rich flamboyant cloister, and some good glass; it was much damaged in 1870. The hôtel de ville, the former bishop's palace, was designed about 1730 by N. Pierson; the cavalry barracks, arsenal, and other edifices are to be noticed. GRILLE DE BEUZELIN, *Archéologie Arrondissements de T. et de Nancy*, fol., Paris, 1855, 38 pl. BARAILLON, *Monuments Celtiques et Romains*, 8vo., Paris, 1806. 28. 50. 96.

TOULOUSE, formerly written Thoulouse (Anc. Tolosa Volcarum). The ancient capital of the Visigoths 413-507; and of Languedoc; and now of the department of Haute Garonne, in France; situated on both sides of the river Garonne, over which are the bridges of S. Michel, rebuilt after 1875; S. Pierre, suspension, which rebuilt after 1855 stood the great flood of 1875; and S. Subra, or S. Cyprien, and later pont neuf, of seven arches, about 860 ft. long, begun 1543 by N. Bachelier, continued by his son Dominique, and completed 1601 by P. Souffron; the archway on it is by F. Mansard. A bridge is described as being 650 ft. Engl. long, of five arches, the centre one about 100 ft. or more, and as built of stone legs or piers with arches, etc., of brick, in GAUTIER, *Traité des Ponts*, 3rd edit., 8vo., Paris, 1755, p. 170, pl. 8. There are the ruins of the castle of Narbonnais, the former residence of the counts of Toulouse. On the left bank is the suburb of S. Cyprien, which contains two large hospitals. The canal du Midi and the canal de Brienne or S. Pierre are renowned works. There are vestiges of the Roman capitol, amphitheatre, and other edifices. At Toulouse and Moissac, the art of sculpture in stone had attained a degree of perfection to which it did not reach in the north for nearly fifty years afterwards (CHISEL, 1120). The houses and churches are chiefly of brick, and of interest (STREET, *Brickwork in the Middle Ages*, in CHURCH BUILDER *Journal*, 1864, p. 155). The renaissance houses are,—de Pierre or hôtel Daguin (gaudy); hôtel de Berruy; hôtel d'Assézat (BERTY, *Renaissance Mont.*, 4to., Paris, 1859-64, i, pl. 36-46; and in NODIER, i); hôtel Felzius, with a portal designed by N. Bachelier; a house in rue S. Rome (BERTY, pl. 47-8); and hôtel de Lasbordes (LA BORDE, *Monumens*, fol., 1836, pl. 230); the one near the bridge may be by Primaticcio. The water-supply to the fountains was carried out by A. Laforgue. Comte D'ESPIE, *Traité—on Flat Arches and Bricked Roof*, 8vo., London (1755), erected his house on this system (p. 44).

The cathedral, dedicated to S. Etienne, is peculiarly built; the nave has a vault of 22 mètres (*i.e.*, 72 ft.), it dates before 1218; all, including the ribs, appears to be of brick covered with a very thin coat of plaster. The flamboyant choir (1475 or) xv cent. is of northern style; burnt 1609, rebuilt 1612; roofed in 1502, for cardinal d'Orléans who built the bell tower, in which is the bell of Cardaillac, weighing 50,000 French lbs.; and the pilier d'Orléans, an isolated column at the church

entrance inside (LA BORDE, pl. 168). The tomb *cir.* 1554 to cardinal d'Armagnac, is by G. Philandrier, who is also buried in the church in a tomb of his own work, 1563. Notre Dame du Taur, end of XIV cent.; it is a vaulted hall with double chancel, or twin apses at each end, and without aisles; the west end is flat with opening for bells and flanked by turrets, a common arrangement in Languedoc (KING, i, 1 pl.). S. Sernin, Cernin, or Saturninus (the first bishop, killed 250), was consecrated 1090, and completed 1096; it is the most remarkable model of the Romanesque style in France; and has been restored by Viollet-le-Duc, and de Baudot. The lofty octangular central tower formed of five tiers is of XIV cent.; the nave of eleven bays with double aisles is XV cent.; the east end is semicircular with five apsidal chapels; the transepts have aisles all round, and four apsidal chapels on the east side: a renaissance door or first portail is attributed to N. Bachelier, *cir.* 1543-53. The crypt under the choir was modernised XIV cent. The wood stalls of the choir date in XVI cent. A model of the church before the revolution shows it formed an isolated fortress apart from the town, walled in by towers and battlements. LA BORDE, *Monuments*, pl. 133-5; KING, *Monuments*, i, 4 pl.; *Archives des Monuments Historiques*, fol., Paris, 1855-72, gives five plates. Church of the Cordeliers; XIII cent., now a granary; a fine example of an ecclesiastical fortress, the windows being placed very high (KING, i, 1 pl.). Church of the Jacobins; one of the finest pieces of brickwork in France; it has a double nave 1250-1300, completed 1336; with side and apsidal chapels of XIV and XV cents. The tower is Italian. The church has been restored and forms the chapel of the Lycée. (*Illustrations*, s. v. Plan, fig. 13; KING, i, 3 pl.) The refectory, chapter-house, and cloisters remain. The picturesque Tour des Augustins is fine brickwork of XV cent.; the church is now part of the musée. S. Pierre, formerly Chartreux, has stalls 1569 or later; in ROUYER ET DARGEL, *L'Art Arch. en France*, 4to., Paris, 1863, ii, 17, pl. 11. The church of the Dominicans had the altar so placed between the pillars of the apse, that four priests could celebrate the mass there at one time; PIGANJOL DE LA FORCE, *Nouv. Descr. de la France*, 8vo., Paris, 1718, vi, 273. The church of La Dalbade, XIII to XV cent.; has a high vaulted roof of 58 ft. span; no aisles; east groined apse; with no lights below and few above. The renaissance west façade and portal are by N. Bachelier; bell tower partly demolished 1793 (NODIER, i, pl. 15). Church of S. Nicolas, consists of nave and chapels without a choir properly so called (KING, i, 1 pl.). Convent and church of the Dames religieuses de la Visitation, were designed, *cir.* 1825, by A. Laforgue.

The place du capitole, formerly royale, has a fountain at each of its four angles: in it is *le capitole*, now the hôtel de ville, *cir.* 1553 by N. Bachelier; it was completed 1769 by J. P. Rivalz or Rivals (VAISSETTE, *Hist. gén. de Languedoc*, fol.; and new edit. by DU MÊME, 8vo.; GUILHERMY, *Bull. Mont. du Comité des Arts*, 1840-41, p. 49; NODIER, i, pt. 1, pl. 21-5): the interior is modern and contains the municipal offices, and a theatre. The façade, finished 1789 or later by G. Cammas, has eight columns of Pyrenean red marble; it is 380 ft. long and 128 ft. high. On the first floor is the salle des illustres having terracotta busts of local men of note. There are two of the ancient courts in the rear. The place Peyrou was designed by Giral and J. Donnat. The place de la Daurade contains the new church of La Daurade, designed 1770 by P. Hardi, erected on the site of a temple; its former Benedictine monastery is now a tobacco factory.

The musée has a good collection of antiquities and renaissance works; one room of its picture gallery is the former church of S. Augustin; its groined hall or chapter-house supported on light shafts, XIV cent.; a reconstruction has been partly carried out by D. Darcy. The cloister has pillars in pairs like the *campo santo* at Pisa; the curious portal of the old church of La Daurade pulled down 1812 was here re-erected; and the portal of the cathedral chapter-house (KING, i, 3 pl.). The arsenal, one of the largest in France, occupies the nunnery of Ste. Claire. The

bâtiments de la Régie are by J. Lacornée. Le couvent de l'inquisition from 1221 is now an educational establishment. The palais de justice has been greatly modernised. The archbishop's palace, *cir.* 1690-93 by A. C. d'Aviler is now the préfecture. The collège S. Raymond, founded XI cent., is now the presbytery of S. Sernin. A collège is given in VERDIER ET CATTOIS, 4to., Paris, 1855-57, ii, 162. The tribunal de première instance, an old edifice, was restored, *cir.* 1822, by A. Laforgue; the cour royale has new buildings. The hospitals of the hôtel Dieu, and of S. Joseph de la grave are vast edifices. The mill of Bazacle. The celebrated amphitheatre of S. Côme (*i.e.*, the room for lectures upon anatomy) was designed *cir.* 17... by ... Giral. Monument 1825 in honour of the dauphin and the French army by Antoine Garnaud (born 1796).

Guide, 16mo., Toul, 1844. *Biographie*, 8vo., Paris, 1823. DU MÊME, *Histoire des Inst. Rel., etc., de la ville de T.*, 8vo., Toul, 1844. MAGUES, *Guide*. AUBISSON DE VOISINS, *Établissement et Description des Fontaines, etc.*, 8vo., Paris, 1839. ALDEGUIER, *Histoire de la ville de T. depuis la conquête des Romains*, 8vo., Toul, 1835. RAYNAL, *Hist. de la Ville*, 4to., Toul, 1759. CAYLA ET PAUL, *Toulouse Mont. et Pict.*, 4to., n. d. CHAMPOISEAU, *Essai sur les ruines romaines de T.*, n. d. MARCHAND, BOURASSÉ ET MANCEAU, *Verrières de l'église de T.*, fol., 1849. NODIER ET TAYLOR, *Voyages Pittoresques* (Languedoc), fol., Paris, 1833-37-42, i, pt. 1, has about 35 plates. KING, *Study Book*, 4to., London, 1858-68, as noted. WARING, *Romanesque in South of France*, read at ROY. INST. OF BRITISH ARCHITECTS, *Sessional Papers*, 1860-61; BUILDER *Journal*, 1861, xii, 155. "Toulouse", in DALY, *Revue Générale*, 4to., 1841, ii, 429; 472. *La Construction Moderne*, contains plates 1888 of buildings. ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Journal of Proceedings*, 1887-88, p. 37, describes the buildings seen by the Congress held there. 14. 28. 50. 96.

TOULTEC ARCHITECTURE. The Toltecs, also written Tulteques, are the most ancient nation known of New Spain: they came from the northwards about 472: about 570 they reached Mexico; eventually becoming incorporated with the Chichimecas, a succeeding nation. The present Mexicans, according to BOLUNNI, left Aztlan, a supposed Asiatic province, about 1160 reaching Mexico about 1220 and then conquering the Toltecs. The general form of the religious edifices of the Toltecs is pyramidal, formed in stages or towers, as at Cholula, Xochicalco, Tehuantepec, Mitlan, and Mount Alvan. The arches of the bridges were formed by a stone laid from pier to pier; or long beams of stone leaning at an angle towards each other and meeting at top; as in two at Tlascala; while at Chilhuittan is a bridge of large blocks the upper surfaces being cut convex and the lower concave, springing from the piers and meeting at the top, like a lancet arch. The roofs of the buildings are triangular, some like an inverted cyma; internally the ceilings are plain-sided triangles, or formed in overhanging courses. The doors were oblong with a straight lintel; the windows are the same, or arched at top, triangular, or like a trefoil head; with other peculiarities noted in the CIVIL ENGINEER, ETC., *Journal*, 1842, v, 185. Much doubt yet exists on this subject.

TOURELLE; see TURRET.

TOURNAI and Tournay (Lat. Tornacum, Turris Nerviorum; Fl. Doornik or Dornick). A town in the province of Hainault, in Belgium, situated on the river Schelde, over which is the pont de Trous, *cir.* 1290, having three pointed arches surmounted by a gallery of defence, and a tower at each end. There are two wide and good quays. The river turns four mills constructed by Vauban, capable of grinding corn for 100,000 men. Part of the Roman wall with two semicircular towers exist on the left bank; on the right bank all the walls of 1280-97 remain. Two good Roman roads exist, to Arras and Bavay. In 1295 the walls were surrounded with ditches and flanked by towers; in 1670 a citadel was constructed by Mesgrigny; the works were all destroyed in 1782; but in 1814 the fortifications were rebuilt, with a citadel on the plan of that at Antwerp, at a cost of

£677,120. Among the domestic works is a house of XII cent. with a round tower of brick, now a magazine, in rue des Carliers; another of brick on place S. Jean; two of brick and stone in the rue des Sœurs de la Charité; another of XIII cent. in rue de l'hôpital Notre Dame; a portal of XV cent. in rue du Four Chapitre; one of red brick and blue stone, *cir.* 1520, rue de Paris; another of brick and stone 1635 in rue des Maux; and one in rue S. Martin 1780. "A bishop of Tournay when in Padua about 1570, having much pleasure in architecture and wishing to transplant the Italian modes of architecture into Flanders, engaged Francesco dai Libri, a young son of Girolamo, to go back with him, who prepared designs copied from the best and most renowned of the Italian edifices, but died before leaving"; VASARI, *Lives*, 8vo., 1851, iii, 450. A statue by Dutrieux was Sept. 1863 erected to Christine de Lelaing, princess of Epinoy, who in 1581 defended the city for twenty-five days against the Spaniards.

The cathedral dedicated to Notre Dame, was rebuilt 1030-1213; the tour de Marie Pontoise, with its pointed roof, the south-east tower of south transept, is pure Romanesque; the other three are Transition; they are connected by a gallery of open arches above the vaulting of the transepts, which have apsidal ends. The vaulting of the nave dates 1777; that of the aisles is ancient. A groined portal of XIV cent. extends the length of the west front. South transept in SHAW, *Cont. Sketches*, fol., 1858, pl. 100: ALLGEMEINE BAUZEITUNG, 1845, pl. 680. The edifice is 423 ft. long, 121 ft. wide at the choir, 218 ft. at the transepts, and 88 ft. 6 ins. across the nave; the height of the choir is 108 ft. The parish chapel in north aisle was erected 1516-18 for Henry VIII of England. The rood screen 1566 by C. de Vrint. The shrine *cir.* 1280 of S. Piat; that of S. Eleutherius, silver gilt, 1247 is one of the finest existing. The good stained glass dating from *cir.* 1465 is by T. Stuerbout of Haarlem; later works by Caprounier of Bruxelles. The edifice was restored *cir.* 1842-52 by B. Renard, who published *N. D. de Tour.*, 8vo., 1842. GODWIN, in CIVIL ENGINEER, ETC., *Journal*, 1843, vi, 8; 34; and BUILDER *Journal*, 1845, iii, 304. *Descamps et Le Maître D'Anstaing, Vitraux de la Cathédrale*, fol., 14 pl., Brux., 1846-48; 1850. LE MAISTRE D'ANSTAING, *Recherche sur l'histoire et l'Arch. de la Cathédrale*, 2 vols., 8vo., Tour., 1842. Church of S. Quentin, rebuilt end of XI cent.; its façade, restored 1860, is a perfect model of the Transition in Belgium. S. Margaret, rebuilt after 1737, except its first pointed tower. S. Jacques, partly rebuilt between 1219-51, and in middle of XIV cent.; the pulpit is an elaborate specimen of foliage and rockwork; ALLG. BAUZEITUNG, 1845, pl. 680. S. Mary Magdalene, founded *cir.* 1251, is late Transition. S. Piat is a small, very ancient, three-aisled church, much altered; the choir, much later, restored *cir.* 1858. S. John the Baptist; rebuilt except the first pointed tower which has a crocketed spire. S. Brice; XII cent.; aisles rebuilt XV cent.; the triforium is hidden by a low roof or ceiling. In 1655, opposite the north door, was discovered the tomb of king Childeric I, who died 482; the important relics, etc., were placed in the Bibliothèque Impériale at Paris. S. Nicole, first pointed; in a south chapel is a carved stall having the Tudor rose, made for and occupied by Henry VIII of England; ALLG. BAUZEITUNG, 1845, pl. 680. Convent of Dames de S. André, 1840 by B. Renard. Old convent of Celestins is now cavalry stables.

The abbatial palace of S. Martin, *cir.* 1770 by L. B. Dewez, has been the hôtel de ville since about 1827; the crypt of the Romanesque church only remains; the church was rebuilt 1671 and destroyed 1801. The *beffroi* is the most ancient in Belgium, the interior at the base being a Roman watch-tower, encased 1187; the buttresses date 1391, and the timber spire later: VERDIER ET CATTOIS, *Arch. Civile, etc.*, 4to., Paris, 1855-57, ii, 140. The Grande Garde (Italian) 1610, originally a cloth hall. Concert-hall 1810, by B. Renard, who 1820 added the portico. The athénée royal, formerly a Jesuits' college, 1634; the hall was the church, a third pointed building. 14. 28. 50. 96.

Cousin, *Hist. de Tournay*, Douay, 1620. CATULLIUS, *Torna-*

cum, 4to., Brux., 1652. POUTRAIN, *Histoire de la Ville et Cité de Tournai*, Capitale des Nerviens, 2 vols., 4to., La Haye, 1750. LE COCQ, *La ville de T.*, 1817. PROUT, *Sketches in Flanders, etc.*, fol., 50 pl. (1837?). STAPPAERTS, *Belgique Monumentale*, 8vo., Brux., 1840-44, ii, 48. WAUTERS, *Délices de Belgique*, 8vo., Brux., 1846, p. 239. STREET, in *ECCLESIOLOGIST Journal*, 1855, xvi, 363. STEPHENS, *Flemish Relics*, 8vo., 1866, with photos.

TOURNAI STONE. In Bruges, before each door of a house is a narrow paving of this stone, the slabs being about a foot square. Like the Rock-hill flag of Yorkshire, it is slippery when worn and wetted. The floors of the halls are also paved with small Tournai slabs.

The CENDRÉE DE TOURNAI, is a kind of artificial pozzuolana.

TOURNAMENT (Ital. *Torneo*). TILTING-PLACE and JOUST. HUGO, *Hist. Gén. de France*, fol., Paris, 1836, iv, pl. 34. 14. 96.

TOUROUX DE MORANZEL (LOUIS FRANÇOIS), *architecte-contrôleur* of the buildings of the château de Fontainebleau, was admitted into the academy of architecture 20 Sept. 1756, and died in 1784 or 1785; he designed 1753 for madame de Pompadour, the pavillon l'ermitage, in the park of Fontainebleau. LANCE, *Dict. Biog.*, 1872.

TOURS (the Cæsarodunum of the Turones). The chief town of the département d'Indre et Loire, and the former capital of La Touraine, in France, situated on the river Loire, over which is the level bridge of S. Pierre, 1,423 ft. long and 44 ft. wide, of fifteen arches, many rebuilt; the wire suspension bridge of Symphorien, 1847 by Seguin, is above it, and below is the pont de Cyr: there are also two bridges over the river Cher, one of 17 and the other of 8 arches. About 1490 the bridge over the Loire and that of S. Anne were repaired; about 1511 the great bridges and those of S. Eloi and S. Sauveur were repaired by G. Besnouard; in 1515 three arches of the great bridge were repaired or rebuilt by M. François; 1559 S. Eloi was repaired by J. Jenson; and in 1581 P. Eudes designed works for that of S. Anne. The remains of a large Roman circus near the cathedral were discovered in 1853, as related in LITERARY GAZETTE, 1853, p. 893. In the infantry barracks is a round tower, the only remains of the castle built XII cent. by king Henry II of England. The arc de triomphe de Louis XIV, 1687-9 is by E. le Chevalier. The best specimen of (renaissance) domestic architecture is No. 35 rue du Commerce, built about 1400 for Jean Xaincoings; restored by its owner mons. Gouin, banker; BUILDER *Journal*, 1847, v, 422. No. 16 rue de Briçonnet, or rue des trois pucelles, is a brick house of XV cent., called Tristain l'Hermite, *temp.* Louis XI; it has a vaulted stair turret 70 ft. high; as the strings (*cordelière*) formed of ropes in relief, also occur on the tomb of Anne of Brittany, and on her chantry at Loches, the house may have belonged to her or to a retainer; there is also an elegant vaulted recess for a lavatory; (CLUTTON, *Dom. Arch. of France*, fol., 1853, pl. 1; VERDIER ET CATTOIS, *Arch. Civile, etc.*, 4to., Paris, 1855-57, ii, pl. 114). Opposite this last house is one much older having a vaulted ground floor, with an arcade of pointed arches on first floor. Other good old houses are No. 24, 26, and 52 rue de la Riche. The renaissance fontaine de Beaune Semblancay is attributed to B. and M. François, *cir.* 1511, and to the brothers Juste, sculptors (BERTY, ii, pl. 24-5); it was 1836 restored; the fontaine de la porte S. Etienne by A. Robin, 1505; and others from 1511 by the family of Valence, as stated in LANCE, *Dict. Biog. Franç.*, 8vo., 1872. The quarries at S. Maur supply a fine-grained and compact stone, which works easily; the stone from Chinou is also used. The town is the see of an archbishop.

The cathedral is dedicated to S. Gatien (the first bishop), or to S. Maurice. The choir was begun 1170; E. de Mortagne was one of its first architects (died 1293) assisted by Simon du Mans: part of the transepts date 1220-66; their fronts finished 1316; a good rose window is in the northern one, which has a light spiral staircase on the crown of the ribs or groins; the vaulted nave is more modern, with two western bays as late as

the west façade, which dates from 1430-1500; its two towers 205 ft. (or more than 260 ft.) high, the south one completed 1547 by P. Gaudier on earlier work; the north or clock tower completed 1507 by M. François is given in BERTY, *La. Ren. Mont. en France*, 4to., Paris, 1859-64, ii, pl. 18-21. The three lofty portals are highly enriched and there is a large eight-light window with good glass. In 1385 André Freredoux was maçon de l'œuvre and executed the tomb (and perhaps chapel) of Jean Gervaise, a canon. J. Dampmartin, J. Papin, and J. Gaudin were 1450-80 maître des œuvres, and C. Rousseau master mason in 1561. The building is 256 ft. long and 85 or 95 ft. wide. The fine tomb of the two children of Charles VIII (1483-98) is the work of Juste and another; contemporaries of J. Goujon (BERTY, ii, pl. 22-3). There are remains of the cloisters and of the *psalette* or song school. A restoration was designed *cir.* 1835 by C. Robelin. LA BORDE, *Monumens de la France*, fol., Paris, 1816-36, pl. 207. NOTES AND QUERIES *Journal*, 1889, 7 Ser., vii, 28, 69, 293. VIOLETT-LE-DUC, *Dict. Rais.*, s. v. Cathédrale, p. 344. Abbey church of S. Julien, completed 1224; the lower part of west tower, xi cent., was in 1847 restored for service: BOURASSÉ ET MANCAU, *Notice hist.*, 8vo., Tours, 1845. Abbey church of S. Martin de Tours; the first metropolitan A.D. 340 (PERPÉTUE the sixth bishop). It was an enormous edifice utterly destroyed in 1790, excepting two towers out of five. One, xii cent., the tour de S. Martin, or de l'horloge (BUILDING NEWS *Journal*, 1869, xvi, 226), was at the south of the west front; the other or la tour de Charlemagne xi cent. stood at the end of north transept. Attached to the former tower are Romanesque pillars and caps of an earlier edifice. A chapel was built 1861 over the rock-hewn tomb of S. Martin under the former high altar; a restored plan of the church built by Perpétue in v cent., is given in CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 143. The church of S. Clement, xvi cent., has a florid north porch and is now the halle aux blés. The church of La Riche, late pointed, has double aisles to the nave and a square east end. S. Rodegonde is Romanesque of x and xi cents. Beyond it are two round towers with a gatehouse, all that remains of the once magnificent abbey of Marmoutier (majus monasterium), xiii cent., one of the richest in France (KITCHEN). On its site is built a nunnery and school of the sœurs de Sacré Cœur and a chapel in the style of xiii cent., by M. Pallu, architect; and two chapels in the crypts adjoining the north transept. The church of the Dames de l'Annonciade, *cir.* 1650, is by J. Le Mercier. Of SS. Gervaise and Protase, Eustochius was the *edificator* when bishop.

The hôtel de ville; the prefecture with a library of over 40,000 volumes; musée, by ... Guérin 1825 (GOURLIER, ETC., *Choix d'Edifices*, fol., Paris, 1825-50, i, pl. 206); the archbishop's palace with a handsome Italian portal; champ de Mars; extensive cavalry barracks; palais de Justice 1840 (Dorio); and the large public library, formerly the hôtel Papian: a salle de spectacle was designed 1828 by J. J. M. Huvé.

GREGORY OF TOURS, *De Gloria Martyrium*, lit. tres., 12mo., Paris, 1640. RITCHIE, *Wanderings by the Loire*, 8vo., 1833, p. 39, 105, 107. CHAPUY, *Fr. Mont. et Pit.*, fol., Paris, 1842. HUBSCH, *Altchrist.*, fol., Carls., 1858-61. INKERSLEY, *Inquiry*, etc., 8vo., 1850. WALCOTT, *Church, etc., Arrangement*, read at ROYAL INST. OF BRIT. ARCHITECTS; BUILDER *Journal*, 1860, xviii, 794; and printed 8vo. (1861). 14. 28. 50. 96.

Touraine was an appanage of Mary queen of Scots and Francis before his accession to the throne; she is said to have drawn revenue from it even while a captive. Tours took the lead in the renaissance of France; PATTISON, *Ren. of Art*, 8vo., 1879. The castellated mansion 1463 of Plessis les Tours, the favourite residence of Louis XI, who died there 1483, is one mile from the city: it was nearly destroyed at the revolution, and has been restored *cir.* 1860 by its owner mons. Petit, advocate. The agricultural college at Mettray, near Tours, is in ALIGEMEINE BAUZEITUNG, 1847, pl. 124. NOEL, *Souvenirs Pitt. de la Touraine*, fol., Paris, 1824. VAYSSE DE VILLIERS, *Itin. descr. de la France*,

etc., 8vo., Paris, 1813-23. BELLANGER, *La Tour. ancienne et moderne*, 8vo., Paris, 1845. BOURASSÉ, *Histoire et Monumens*, fol., Tours, 1855.

TOURS (EUFRONIUS of); see EUFRONIUS.

TOWEL ARCHES, at Norwich cathedral. W. of WORCESTER used the word *maritagia* in error, in describing the west walk of the cloisters; HARROD, on reference to the MS. found the word to be *manutergia*; KING, *Eastern Cathedrals*, 12mo., 1862, p. 137.

TOWEL CLOSET, or AUMBRY. See LAVATORY.

TOWEL PATTERN. See LINEN PATTERN.

TOWEL RACK. Two rails of wood or brass, on the same level, six inches apart, to hang towels upon, so that air can pass under them. An example from Cologne is given in *Illustrations*, s. v. Metal work, 1861, pt. 1. A common form is a wood roller three inches diameter with side pieces to turn in, supporting an endless towel, and ordinarily called a "round towel".

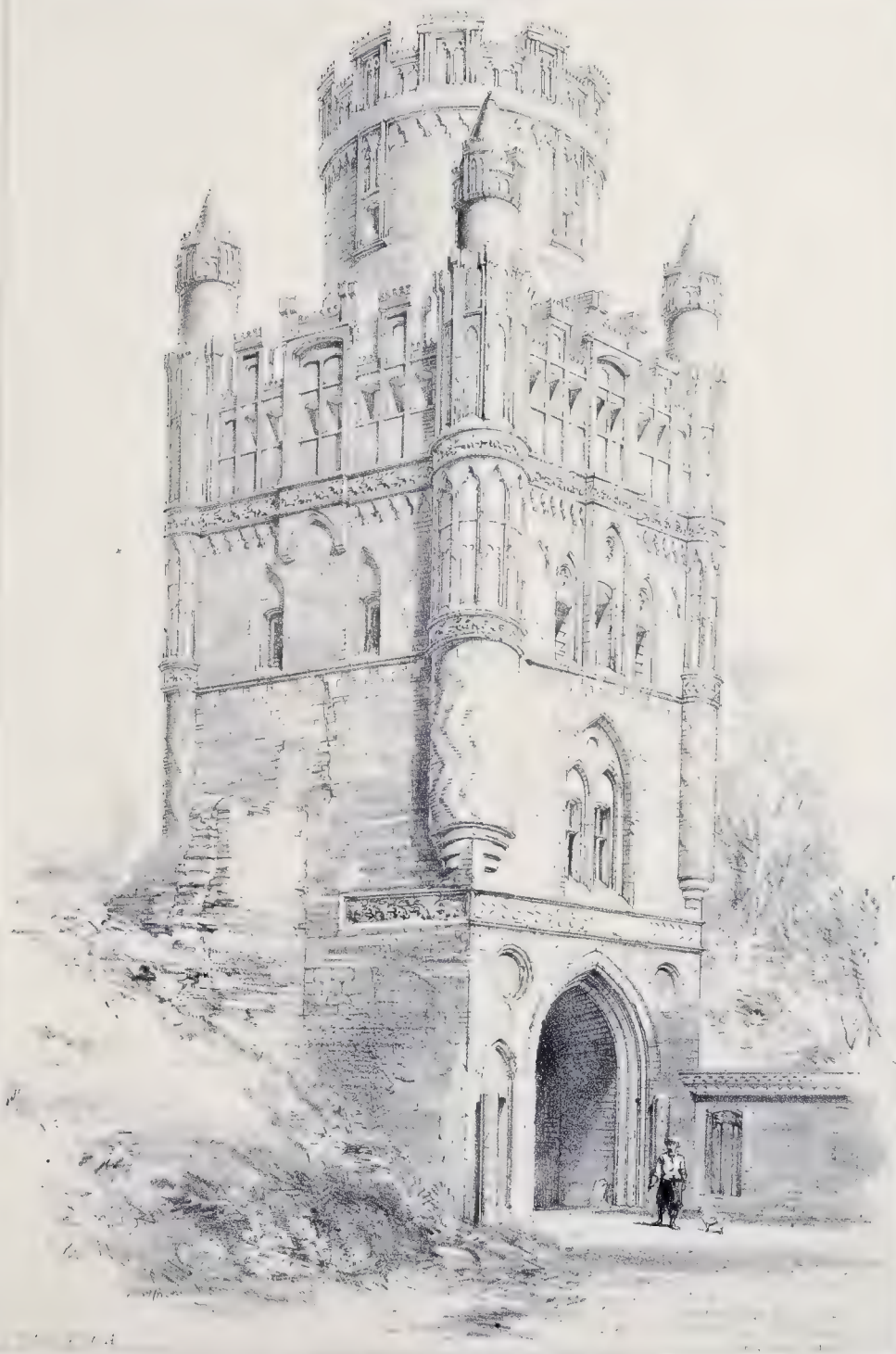
TOWER (Gr. *rupais*; *τύπος*; Lat. *turris*; Fr. *tour*; *clocher*; and *tourelle*, or little tower; It. *torre*; Sp. *torre*; Ger. *thurm*; Ang. Sax. *tor*; Welsh *tur*; Hind. *minar*). A lofty building, insulated or otherwise, originally designed for defence. They are of remote antiquity, and are mentioned in the earliest Scriptures, as the tower of Babel. In mediæval times towers were generally attached to churches, to cemeteries, to castles, or were used as bell-towers. To describe these in countries and periods is beyond the limits of this work. Besides the publications named s. v. Steeple, are the following:—DURAND, *Parallèle des Edifices*, fol., Paris, 1800, text 1842. *Eglises, Châteaux, Beffrois, etc., de la Picardie et de l'Artois*, 2 vols., 8vo., Amiens, 1849. RICKMAN, *Attempt*, 8vo., Oxford, 1862, 6th edit. WALCOTT, *Towers and Spires*, in BUILDING NEWS *Journal*, 1865, xii, 258, 275, 295, gives numerous details: also WEBB, *Continental Ecclesiology*, 1848. WICKES, *Towers and Spires*, 3 vols., fol., 1858-59.

The churches of

Bedfordshire and Northamptonshire; ASSOCIATED SOCIETIES, *Reports and Papers*, 1885, pt. 1.
Somerset; by FERREY, in COTTLE, S. M. *Mag.*, Taunton, 8vo., 1845.
Early French; JOHNSON, E. F. *Churches*, fol., Newc., 1864.
Caen; PARKER, at ROY. INST. OF BRIT. ARCHITECTS, 26 Jan. 1863.
Kilkenny; DEANE, *Cath. of S. Canice, etc.*, 1866, p. 86.
Sir Chris. Wren; by A. T. TAYLOR; 8vo., 1881; and by CLAYTON, read 5 and 26 April 1882, at ROY. INST. OF BRIT. ARCHITECTS.
Germany; BUILDER *Journal*, 1865, xxiii, 692-3.

When an early church had a tower at its first building it was often in the centre. The greater number of parish churches were without towers at first. The little church at Adel, in Yorkshire, is an unaltered and typical example of what most others have grown from. In later times, and chiefly in the xiv and xv cents., towers became fashionable, and it was a very poor parish which was without one in xvi cent. These towers were built very slowly and it was important to avoid disturbing the church and interfering with its continued use, as would have been done by breaking into it, especially in the middle. The new towers were therefore built on fresh ground outside, generally at the west end; and then, when the work was done, the west end of the nave was taken down and the building joined on to the tower. The same was also often done in churches which had at first a central tower, for, if for any reason the tower had to be rebuilt, it was easier to do it outside than inside the church. This was the common case, for in xii cent. the towers were much given to tumbling down, and the earlier ones had very heavy piers; these took up room, and were likely to be condemned as obstructions during the progress of later improvements. Thus it has come about that in spite of the central position being the normal one in a parish church, it has been almost wholly superseded by the western. In ecclesiastic edifices, the numbers, forms, proportions, and details of towers greatly varied. DUCANGE, fol., Paris, 1736, p. 1356, s. v. *Turris*, states that the tower and spire together were built equal to the whole length of the building; MILNER, *Treatise*, 8vo., 1811, p. 105. HAWKINS, *History*, 8vo.,

I. W. F. R.



THE TOWER OF THE BISHOP OF ELY



1813, p. 195, quoting BROWNE WILLIS, *History of Abbeys*, 8vo., ii, 8. Cistercian abbeys had low towers, tall ones being forbidden. The following table is given by WALCOTT (p. 296):—

Churches with Spires.

| | Breadth. | Length. | Height of steeple. |
|---------------------|----------|---------|--------------------|
| Salisbury Cath. ... | 82 ... | 450 ... | 401 |
| Norwich ... | 70 ... | 408 ... | 369 |
| Chichester ... | 92 ... | 380 ... | 271 |
| Louth ... | 76 ... | 182 ... | 291 |
| Coventry ... | 120 ... | 252 ... | 320 |
| Old St. Paul's ... | 90 ... | 590 ... | 527 |

Churches with Towers.

| | | | |
|----------------|---------|---------|-----|
| Lincoln ... | 90 ... | 468 ... | 260 |
| Canterbury ... | 73 ... | 514 ... | 229 |
| York ... | 106 ... | 466 ... | 200 |
| Durham ... | 81 ... | 473 ... | 215 |
| Gloucester ... | 83 ... | 408 ... | 225 |

A tower built over the eastern bays of the nave at Wymondham, Norfolk, shuts off all communication with the nave which served as a parish church. At east end of Newhaven church; of north aisle of Patching; and of south aisle of S. George, East Grinstead, all in Sussex; NOTES AND QUERIES *Journal*, 1871, 4 Ser., viii, 265, 359. The tower and lofty spire at church of S. John the Baptist, Halesowen, stands midway between the west doors and the chancel; its position is remarkable, perhaps no other instance; ASSOCIATED SOCIETIES, *Reports and Papers*, 1878, p. 91. A central tower used as chancel, and the chancel as sacristy, FREEMAN in *ECCLIOLOGIST Journal*, 1848, ix, 53. Two churches together, with tower at east end, at Usk, having been originally both a monastic and parochial church; CHURCH BUILDER *Journal*, 1877, p. 49. A triangular tower occurs at All Saints' church, Maldon, Essex. TRANSEPT tower.

Fall of a tower. A list is given in BUILDER *Journal*, xix, 1861, Apr. 13; and 1862, xx, 276; and Chichester, on 21 Feb. 1861; *idem*, 1861, xix, 143.

In the north of Italy, and in Rome, the mediæval towers are often tall square shafts in four to six stages without buttresses, with couplets or triplets of semicircular-headed windows in each stage; they are generally crenellated at top, and covered with a low pyramidal roof. The well-known hanging or leaning tower at Pisa is cylindrical, in five stories. The Asinelli and Garisendi towers at Bologna are curious examples of family pride and warfare. In Ireland, there are in some of the churchyards very curious tall ROUND or PILLAR TOWERS, supposed to have been erected as places of refuge. Mahomedan edifices have lofty towers called MINARETS attached to the mosques. The PAGODA of China and Hindostan are variations of the subject; FERGUSSON, *Indian, etc., Architecture*, 8vo., 1876, gives a long list in the index. The "tower of the winds" at Athens is a hardly legitimate application of the term. The Eiffel tower, at Paris, of iron is 300 mètres high (1889).

A SPIRE is a pyramidal addition. STEEPLE, comprises the tower and spire. TURRET is a projection from an angle of a wall, either from the ground to contain a staircase; or above ground to provide a means of looking around. PINNACLE is a small, solid spire, as to a buttress, or rising from a parapet: a large pinnacle at the angle of a tower is often called a TURRET. A CROWN SPIRE also forms a termination; SADDLE BACK is another. Information may be found under BARTIZAN; BELVEDERE; BELFRIY; BELL TOWER; CASTLE; CLOCHARD or clocher; CEMETERY BEACON; CAMPANILE (*Detached Essay*); DUNGEON; FRAME TOWER; GAZEBO; GATE-HOUSE; KEEP; LIGHT-HOUSE; PEEL; PHAROS; ROUND TOWER; SHOT TOWER; SMOKE TOWER; STEEPLE; WALL TOWER; WATCH TOWER; WATER TOWER. 19. 25. 96.

TOWER. The White tower of London, measures 116 ft. by 96 ft. and 92 ft. high: it is considered to have been built by GUNDULPHUS, *cir.* 1078, for William I. Alnod or Alured, ingeniator 1174, 20 Henry II, was paid £6 13s. 4d., and 100s. for works therein. The fosse was formed by William Longchamp (1189-97), bishop of Ely. The plan 1597 is given in VETUSTA ARCH. PUB. SOC.

MONUMENTA, i, near the end. BAYLEY, *History of the Tower*, 2 vols., fol., 1824-5. KEEP.

ARNOULD ET DU PUJOL, *Histoire de la Bastille depuis sa fondation, 1374, jusqu'à sa destruction en 1789; suivie par Le Doyon de Vincennes*, 8 vols., 8vo., plates, Paris, 1844.

TOWER LIGHT or WINDOW. The small upper light of a Perpendicular window is so called in the *Rites of Durham*, p. 82-3. See LIGHT (Angel); SOUND HOLE; SPIRE LIGHT. Those in the belfry of S. Menoux, near Souvigny (Allier), in VIOLETTE-DUC, *Dict. Rais.*, s. v. Clocher, p. 331. 16.

TOWN. (Lat. *urbs*, a walled city; *oppidum*, the open town; Sax. *tan*, any enclosure; It. *città*; Fr. *ville*; Ger. *stadt*; Suburb, It. *borgo*; *borgho*). The term applied to an enclosed, or fortified assemblage of houses; a walled or fortified place; any collection of houses too large to be termed a village; and differing from a CITY chiefly in not being, nor ever having been, the see or seat of a bishop. Towns are divided into cities, boroughs, and upland or country towns; the two first are governed by their own elected officers. BOROUGH. CITY. COWELL, *Interpretet*, fol., 1727. DUCANGE, s. v. Civitas, Burgus, Villa, Oppidum, Municipia, Colonia. PENNY CYCLOPEDIA, s. v. City, Borough, Town. ENCYCLOPEDIA BRITANNICA, 9th edit.

Hippodamus, in second half of v cent. B.C., laid out the Peiræus (MUNYCHIA), near Athens, for Pericles, and introduced broad streets crossing each other at right angles; he laid out Thurium on the same system B.C. 443; and 408 the city of Rhodes. In most towns of Roman origin, the plan is the same; a parallelogram with a gate in the centre of each face, and the principal streets carried through in straight lines crossing each other at right angles in the centre of the town; but no regular plan seems to have been followed in the four quarters into which the town was thus divided. Another class consists of those which have gradually clustered round a castle, or a monastery; in such cases no regular plan can be expected, as each person built according to his convenience, or as he gained permission. Another class is the town entirely founded in the middle ages, built from the foundations with some specific object; more symmetrical and regular than most modern European towns, and built on a plan combining very close packing with great convenience, while the principal streets are wide, open, and straight, crossing each other at right angles only. The parallel streets are at a short distance from each other, and between each pair is a narrow street or lane corresponding in situation and use to the modern mews. In some towns, each house also was divided from its neighbour by a narrow passage leading from the principal street to the lane, and serving both as a watercourse and a surface-drain. When a larger house was required two plots were joined; and in some towns the passages were not used. The principal streets were about 24 ft. wide, lanes 18 ft., and passages 6 ft., probably using the French toise of about 6 ft. In larger towns 30 ft. was the width of the main street. Montpagier, 1284, is the most perfect and regular of the English towns founded in Aquitaine and Guienne by Edward I of England, where they are known as the English towns or Bastides, "New towns", and "Free towns", "ville neuve" or "ville franche"; and still known as *villes anglaises*, although the title is objected to by VERNELLE, in DIDRON, *Annales Arch.*; the earliest of which is supposed to be Montségur, founded 1265. In the same district is Sauveterre, Molieres, La Linde, Sainte Foy, all having a central market surrounded by arcades; Beaumont built 1272. In 1298 Edward I wrote from Bordeaux to London for four competent persons "to divide, order, and arrange, a new town"; *Documents Français Inédits*, i, p. cccxj. No less than fifty towns were founded by the English in France, within the same number of years. GUADEL, *S. Emilion*, 8vo., 1841. GUINODRE, *Hist. de Libourne*, 8vo., Bordeaux, 1845. DU COURNEAU, *Guienne Historique*. DROUYN, *La Guienne Anglaise*, 4to., 1860. Winchester, *cir.* 1067 was a city second only in importance to London. Ludlow, as a mediæval town was next to Chester. Winchelsea is one of Edward I's towns in England; LELAND, *Itinerary*, 1710; 8vo., Oxford, 1744-5, vi,

58, states that bishop John Kirkeby, bishop of Ely, was sent 1277 to lay it out; TURNER and PARKER, *Dom. Arch.*, 8vo., 1853, ii, 158; COOPER, *History of Winchester*, 8vo., 1850: Hull was another town of Edward I's; PARKER, p. 164; also ii, 153. FREEMAN, *Some less known towns of Southern Gaul*, in *ENGLISH ILLUSTRATED MAGAZINE* for Oct. and Nov. 1886. *Historic Towns of England*, edited by FREEMAN, 1886, etc. CHARNAY, *Ancient Cities of the New World*, transl., 8vo., 1887. MERIAN, *Topographia Helvetiae*, fol., Frank. am Main, 1654. SITTE, *Stadt Bau nach seinen Künstlerischen Grundsätzen*, 8vo. Vienna, 1889.

Amongst the plans of cities published by the SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE, those of Philadelphia, Turin, New York, Parma, and Florence afford the most striking examples of regularity of plan. If this regularity be a merit, which in a picturesque point of view it certainly is not, many smaller towns may claim, like Carlsruhe and some of the American towns, to rank before most of those European cities which have grown in mediæval times around a castle, or conventual establishment, like the old parts of Berlin, Bordeaux, Copenhagen, Edinburgh, Frankfort, Lisbon. BLAEU, *Nouveau Théâtre d'Italie*, etc., 250 pl., fol., Amst., 1704.

TOWN (TOWNE), born 1784 at Thompson, Cont., practised at New Haven; "architect and bridge engineer recently from the east", then (1829) took A. J. Davis into partnership, and designed the state capitol and episcopal church at New Haven; the residences of J. Hillhouse, junr., and A. N. Skinner; the presbyterian church and town hall at Middletown street; the house of ... Bowers, and S. Whitmarsh, at Northampton, Mass.; city hall at Hartford, Connecticut: at New York, the church of the French protestants; the west presbyterian church; A. Tappan's store in Pearl street, where granite piers were first used; and Jones's court, Wall street: the capitols of Indiana, and of North Carolina: made designs for accommodating departments at Washington: new patent office, etc., at the capitol; for the university, merchants' exchange, Astor hall, Clinton hall, and many residences; many of which are detailed in DUNLAP, *Arts of Design in U.S.*, 8vo., New York, 1836, ii, 409-11: and 1833-41 the custom house (later the United States treasury and assay office) at New York. Nearly all the best villas at New Haven were built on the system of hollow walls introduced by Town into America. He published from a purchased MS., *Particular Survey by Adm. Sir Geo. Collier performed in America during 1776-9*, 12mo., New York, 1835; also *Suggestions for improving the style and manner of Building in New York*, 8vo., 1836; and *Improvement in the principle, construction, etc., of Bridges, for roads, etc.*, 8vo., N.Y., 1821; and 4to., 1839; also *School House Architecture*. A bridge at Richmond, Virginia, is given in DALY, *Revue Générale*, 1840, i, 33. His system of truss or LATTICE BRIDGE is explained s. v.; and in HANN and HOSKING, *Bridges*, 8vo., 1848-50, pl. 2, p. 76 at end. *Illustrations*, s. v. Bridge, 1861, pt. 2. ALLGEMEINE BAUZEITUNG, 2nd ser., 1851, i, pl. 291; and pl. 396. Some drawings by him are in the library of Roy. Inst. of Brit. Architects. He died 13 June 1844, at New Haven.

TOWN HALL (It. *broletto*; *palazzo publico*, or *comunale*; Fr. *hôtel de ville*; Ger. *stadthaus*; *rathhaus*; Span. *ayuntamiento*). An edifice arranged for the transaction of the public business of the town or city; sometimes it contains the residence of the chief magistrate. The nave of a parish church was in early days the common hall of the parishioners and was used for many secular purposes. It is needless to give any list, even of the most celebrated; the following architectural publications give illustrations; also each place may be referred to in this work. MOOT HALL. PORCH to *rathhaus*. MANSION HOUSE. DURAND, *Parallèle des Edifices*, fol., Paris, 1800. VERDIER ET CATTOIS, *Arch. Civile*, 4to., Paris, 1855-57, ii. CALLIAT ET LE ROUX de LENCY, *Hôtel de Ville de Paris*, fol., Paris, 1844-56. *Eglises, etc., et hôtels de ville de la Picardie et de l'Artois*, 2 vols., 8vo., Amiens, 1849. NARJOUX, *Architecture Communale*, 4to., 1870. PENNY CYCLOPEDIA, 2nd Suppl., 1858, p. 556, s. v. Public Improvements. STAPPAERTS, *Belgique Monumentale*, 8vo., Brux.,

1840-44. BUILDER, BUILDING NEWS, ARCHITECT, and BRITISH ARCHITECT, *Journals*, *passim*. 1.

TOWN SURVEYOR. See SURVEYOR.

TOZZO (ti); 1205 designed or built the palazzo Tolomei at Siena, now much altered.

TRABEATION. Another term for ENTABLATURE, or entablement; (BLONDEL uses *Travaison*). The trabeation, instead of arcuation, exhibited in four colonnaded stories of the baptistery at Parma, is a peculiarity. 1. 2. 4. 25.

TRABS; TRADES. The Latin term for a timber of a roof, similar to the modern wall plate. In ecclesiology, the beam succeeding to the *arcus triumphalis*, and preceding the *statuarium*, or rood loft, being placed at the junction of the nave and chancel or choir. LOFT. PRONI. VIOLLET-LE-DUC, *Dict. Rais.* s. v. 4. 19.

TRACAGNINO MARBLE; also Seme Santo; see BRECCIA.

TRACEING. In goldsmith's work; "Laying the ground even and smooth, the embossed parts being hatched or freed"; HOLMES, *Academy*, fol., Chester, 1688, iii, 259.

TRACERY (Med. *form pieces*; Fr. *croisillon*). Intersecting ribwork in the upper part of a window. Also on the surface of a vault; on walls, doors, panels, canopies of screens, tabernacles, etc. "Early antiquaries make use of an awkward circumlocution for this word." PLOT, *Nat. Hist. of Staffordshire*, fol., Oxford, 1686, refers to the tracery of a window in Lichfield cathedral: "Trasery, the working of the top part of a window to several forms and fashions", in HOLME, *Academy of Armory*, fol., Chester, 1688, iii, 112; and WREN, *Parentalia*, fol., 1713, 1750, p. 302, 304, 307, use it; while BENTHAM and MILNER gave it currency. The complicated frame, or pattern work, formed in the head of a window in mediæval architecture, by the mullions being continued upwards, but diverging into arches, curves, and flowing lines enriched with foliations. Each country has had its successive styles of tracery. It is minutely analysed and illustrated in WILLIS, *Arch. of the Middle Ages*, 8vo., Camb., 1835, chap. 6. GARBETT, *Principles of Design in Architecture* (Weale), 12mo., 1850. BILLINGS, *Infinity of Geometric Design as regards Tracery*, 8vo., 1849. BRANDON, *Analysis of Gothic Architecture*, 4to., 1849. SHARPE, *Decorated Window Tracery in England*, 8vo., 1849. WEBB, *Continental Ecclesiology*, 8vo., 1848, and of Italy. VIOLLET-LE-DUC, *Dict. Raisonné*. FREEMAN, *Origin and Devel. of Window Tracery in England*, 8vo., 1851. WILLIS, *Vaults of the Middle Ages*, in ROY. INST. OF BRITISH ARCHITECTS, *Transactions*, 4to., 1842: and WEST, *Development of Gothic Vaulting*, *idem.*, *Sessional Papers*, Nov. 1874. 1. 10. 16. 17. 19.

EDGE. FOIL. FOLIATION. FORMEPEYS. FORMA. FORMULA. GEOMETRIC. NET. PLATE. ROUND WINDOW. SHRINE WORK. STUMP. TANGENTIAL. WHEEL WINDOW.

In 1541 the architect P. Iturriza was called to account for decorating the church at Plasencia in Guipuzcoa, with work that was too minute; but skilled persons "peritos en la gime-tra" approved of it. The ENCYCLOPEDIA BRITANNICA, s. v. Stone masonry, 8th edit., 1860, xx, 734; and 9th edit., iv, p. 468, gives a useful diagram with instructions. BILLINGS, *Infinity of Geometric Design as regards Tracery*, 8vo., 1849. HOFFSTADT, *Gothisches A.B.C. Buch*, Frank., 1840, translated by AUFSCHLAGER, *Principes*, Paris, 1847, shows the proportioning of mouldings as reduced to a system. BRANDON, *Analysis of Gothic Architecture*, 4to., 1849, has not attempted the subject.

Bar tracery, where the tracery appears to be formed by the intersection of bars, upon the advance from PLATE TRACERY. This appears to have been first used in the Sainte Chapelle at Paris; and immediately afterwards in the chapter-house at Westminster; PARKER, *Comparative Progress of Architecture in England and France*, BUILDER *Journal*, 1860, xviii, 300. "Earliest example in England", SCOTT, *Gleanings at Westm. Abbey*, 8vo., 1863, p. 21; and his *Lectures*, 8vo., 1879, i, 175. BRANDON, *Analysis*, 4to., 1849, p. 26. RUSKIN, *Stones of Venice*, 8vo., 1851-53.

TRACE WHEEL. To wind up stone; HORMAN, *Vulgaris*, 4to., London, 1519, p. 241.

TRACHELIUM (Gr.). The neck. The space between the hypotrachelium and the mass of the capital of a Doric, or an Ionic column. HOSKING, *Architecture*, in *ENCYC. BRIT.*, 8th edit., 1853, i, 513.

TRACHYTE. Inasmuch as the neighbourhood of Assos is entirely volcanic, serpentine being found before arriving at the mica schists which form the upper regions, TEXIER, *Descr. Asie Mineure*, fol., 1839-49, ii, 195, 197, observed, with regard to the statement of STRABO and other authors to the effect that a stone procured at the above-mentioned city was exported even to Rome for the purpose of making sarcophagi in which the flesh was rapidly consumed, that all the tombs at Assos were of volcanic productions, especially trachyte; and states that all his researches had led him to the belief that such materials, impregnated as they usually are with sulphate of alumina or vitriolic and arsenical salts, rather preserved flesh than consumed it. SARCOPHAGUS. ASSOS.

A tough grey stone, used for houses, generally of one story, at Horta, a town in the island of Fayal, one of the Azores. 50.

TRACING. A mechanical copy of an original produced by following its lines through the aid of a transparent medium.

TRACING BOARD. The term "ij tracyngebordes" is found in the list 1399 of the contents of the mason's "loge" or workshop attached to York cathedral; BROWNE, *York Cath.*, 4to., London, 1838-47, p. 198; and SURTEES SOCIETY, *Fabric Rolls*, 8vo., 1859, p. 17.

TRACING HOUSE AND ROOM. The workshop of the mediæval master mason. LODGE. 1374-5, "Custus nove domus in Calendarhay vocate Trasyng hous £9. 19. 7½, besides the timber used de stauro capituli," OLIVER, *Exeter Cath.*, 1861, p. 385. 1464, 4 Edward IV., "Storehouses, tracteries, voides places for framynge, longynge unto the said office (of Works) within our palace of Westm. Toure of London, etc.," *Rolls of Parliament*, v, 530a. 1581-82, at York, "for xi daies work on the leades over the tracinge hows, etc., 10s. 8d.," SURTEES SOCIETY, *Fabric Rolls*, 8vo., 1859, 118; 358. The two-storied eastern chapels (Decorated) of the north transept at Christchurch priory, Hampshire, were occupied as archive and muniment rooms, in one instance certainly as a "designing room", appropriated to the master of the fabric; WALCOTT, in *GENTLEMAN'S MAGAZINE*, 1861, 3rd ser., xi, 635; *idem*, 1860, viii, 277.

TRACING MATERIAL. Thin paper, preferably tissue, prepared to be transparent and to receive water-colours for copying drawings. "Flax paper" was used for this purpose 1827; *ARCHÆOLOGIA*, xxii, 108. One of the earliest receipts is given in *MECHANICS' MAGAZINE*, 1824, p. 365. At this time and later, each artist used to make it for his own use, Canada balsam, nut oil, and turpentine being a customary formula, and French transparent paper was also obtained. Excellent tracing paper has been obtained since 1850; and is now to be obtained of varying degrees of stoutness and transparency, in rolls up to 56 inches wide by 22 yards long. *BUILDER JOURNAL*, 1846, iv, 17, 399. To mount tracings, *B. J.*, 1857, xv, 530. French system of tracing drawings on white paper; *idem*, 1861, xix, 734; 761. *BUILDING NEWS JOURNAL*, 1869, xvii, 118. Tracing cloth up to the same dimensions, is fine cambric prepared for tracing upon, by being treated with a solution of white wax, its passage under or over hot rollers highly glazes it, one side is rendered dull for taking pencil marks, by a jet of steam being played upon it as it leaves the rollers. The glazed side takes ink and colour more readily if it be rubbed with powdered chalk. Large areas of colour shrink the cloth perceptibly, so the tint is usually limited to the walls or edgings.

Tracings having black lines on white ground, by exposure to light and immersion in water only; by Shawcross's patent 1885, by G. J. Poore and Co., *BRITISH ARCHITECT JOURNAL*, 1888, May, p. 335-6. Ferro-Prussiate paper, white lines on blue ground,

in rolls 30 and 40 ins. wide; copied by sunlight 1887 by J. Poore and Co.; also by Marion and Co. Willis's patent aniline process of photographic printing, by V. Brooks. FUSCHER has discovered (*Journal of the Society of Arts*, 1875) a method for rendering ordinary drawing paper transparent during the time that a tracing is being made, and afterwards restoring its original appearance. The process consists of dissolving a certain quantity of castor oil in two or three volumes of pure spirits of wine, according to the thickness of the paper, and of applying this solution by means of a sponge. The spirit evaporates at the end of a few minutes, and the paper is ready for use. The drawing may be made in pencil or Indian ink. Its original opacity is afterwards restored to the paper by plunging it in pure spirits of wine, which may be kept for dissolving the wine on future occasions.

TRACTION. The act of drawing a body along a plane, usually by the power of men, animals, or steam; or when a vessel is towed on the surface of water, or a carriage moved along a road. The power exerted in order to produce this effect is called the force of traction. This force is found to vary nearly with the term $(w-v)^2$, where w is the greatest walking velocity of a man or horse when unresisted (6 feet per second or 4 miles an hour, for a man; or 10 feet per second or 6½ miles per hour, for a horse); and v is the velocity with which the vessel or carriage is moved. It has been determined that the greatest effect is produced when the velocity of the object moved is one-third of that with which the man or animal can walk when unresisted. GRADIENT. HORSE POWER. ROAD. SLOPE. Angle of REPOSE. *Aide Mémoire*, 8vo., 1845-52, s. v. power of a horse on inclines, p. 231, 252, and s. v. Roads, p. 305. MACNEILL, in *INSTITUTION OF CIVIL ENGINEERS*. GUYONNEAU DE PAMBOUR, *Locomotives*. PARNELL (lord Congleton), *Treatise on Roads*, 8vo., 1838. MCADAM. BEVAN. N. WOOD, *Railroads* 8vo., 1831; and letter by T. GRAHAME, 1831. *BUILDER JOURNAL*, 1843, i, 535; 1853, xi, 21. GREGORY, *Mechanicks*, 8vo., 1862, p. 369.

TRAIL. A running, or continuous, enrichment of leaves or flowers, with their tendrils and stalks; common in Gothic architecture. NICHOLSON, *Diet.*, 1835. Anything drawn or dragged. A "traylor of levys", a series of square flowers set at regular intervals. The guilloche ornament is called "a trayle of filets continuing in square angles", by sir C. Wren: and a double waving line is called a "traylor" by Inigo Jones. 16. 17.

TRAINING SCHOOL AND COLLEGE. The following gives some of those so styled; reference can be made to INDUSTRIAL SCHOOL, etc. TECHNICAL SCHOOL. REFORMATORY.

Kneller Hall T. S., Whitton, Middlesex; 1850; J. G. Mair. *B. J.*, viii, 67. Oxford Diocesan T. S., Culham, Oxfordshire; 1851, J. Clarke. *B. J.*, ix, 751.

Exeter Diocesan T. C., 1855, J. Hayward of Exeter. *B. J.*, xiii, 42. Derby Diocesan Institution for T. S. for mistresses, 1851, by H. I. Stevens. *C. E. J.*, xiv, 597.

Salisbury Diocesan T. S. for mistresses, 1853, is in the King's House, at Salisbury.

Cheltenham; 1849, by Elmslie and Lee; *ARCHITECT JOURNAL*, i, 24-5; 61; 78.

— Church of England T. C., 1849-54, by S. W. Dankes; *C. E. J.*, 1854, xvii, 41.

Dublin; elevation by J. Owen of Board of Works, *C. E. J.*, 1844, vii, 18. London. National Art Training School.

— Wesleyan Training college and Normal schools for male students, 1849-50, by James Wilson; *CIVIL ENGINEER, ETC., JOURNAL*, xv, 1; *BUILDER JOURNAL*, viii, 607; *ILLUSTRATED LONDON NEWS*, xviii, 117.

— National T. S. for music, Kensington; 1874, Lieut. H. H. Cole, R.E.; *B. J.*, xxxii, 599, 609.

ROBSON, *School Architecture*, 2nd edit., 8vo., 1877.

TRAIT (ART DU). The French term for laying out of work in construction. VIOLET, *Diet. Rais.*, s. v. 5. 25.

TRAJAN. The emperor 98-117 of Rome. A great builder, Apollodorus being his chief architect. A.D. 104, the magnificent stone bridge 80 ft. high, 60 ft. wide, and 4,770 Roman feet long, over the river Danube, near the junction of the river Alt or Aluta; at SOZORNEY or SZERNIEZ, in Hungary; Poridza or Porez

in Temeswar, or Scala Gladova; destroyed by his successor Hadrian; repaired 322 by Constantine; Dio Cassius, lib. 68, c. 13, 15, 16; GIBBON, *Decline*, 8vo., edit. 1853, i, 515; iv, 337; BEATTIE, *Danube*, 4to., 1844, p. 223-4; plan drawn 1735 in British museum, *Add. MS.* 15,505, f. 24. At Rome, an odeum; a gymnasium; a bibliotheca; the forum Trajanum; the theatre in the Campus Martius, destroyed by Hadrian; A.D. 114 the Trajan column, raised by the Senate and Roman people, 144 Roman feet high (115 ft. Engl. with capital), to commemorate his victory over the Dacians, it is sculptured with the story of his exploits (POLLEN, *Column*, 8vo., 1874); and under which the emperor was buried; cast full size in South Kensington museum; (BUILDER *Journal*, 1873, xxxi, 787); basilica Ulpia of which so much has lately been recovered (Canina's restoration, BUILDING NEWS *Journal*, 1885, xlix, 1019); the thermæ Trajanæ, intended for women; and several aqueducts, bridges, and roads, or repairs to them. The palace 107 A.D. at Rauneh near Alexandria. The arch to Trajan at ANCONA, 112, erected by his wife Plotina and sister Marciana. The arch to Trajan, and a column (by the inhabitants), at BENEVENTUM. A granary at MYRA; (BEAUFORT, *Karamania*, 8vo., 1817); several cities in Dacia, as NIKOPOL in 103; and he rebuilt Antioch and other towns in Syria. The port near OSTIA. The floating palace on the lake of Nemi; it was over 500 ft. in length, 270 ft. in width, and 60 ft. depth. It sank in 1535. MARCHI of Rome descended in a diving machine and described it. BROTIER, *Tacitus*, app. and notes; EUSTACE, *Classical Tour*, 8vo., 1817, 4to. edit., i, 438, ch. 20. FRANCKE, *Zur Geschichte Trajans und seiner Zeitgenossen*, 1837. BURN, *Rome*, 4to., London, 1871. 25.

TRAJANOPOLIS. The later name of SELINUS in Cilicia, from A.D. 117, when and where the emperor died, and now called Selenti; he was born in 53 at Italica, in Spain. Trajanopolis in Thrace was most probably built by the same emperor, who adorned it with beautiful edifices; its site has not been excavated: part of an aqueduct remains. Another Trajanopolis is now Trani, in southern Italy. 28. 96.

TRAJECTUS. See UTRECHT, in the Netherlands.

TRALLES. See AIDIN, Iden, or Guzel-hissar, in Asia Minor.

TRAMMEL. An instrument for describing an ellipsis by continued motion. A rod having sliding pieces to which are affixed points, with which to describe large circles, or set off long distances, on paper. A bar carrying a pencil and guided by two pins which move in grooves. HOPPUS, *Gentleman's Repository*, 4to., 1737; 1748, p. 10. ELLIPTOGRAPH.

A moving instrument of iron in a chimney, whereon the pot is hung over the fire. The rod, etc., for working plaster moldings to arches; GIGSTICK. 4.

TRAN. The name in Huntingdonshire given to a bundle of twenty-five oak staves or spokes.

TRANÇE. (Fr. *tranche*). A scraper. A local name for transom. To reduce superfluous wood by adzing, or traversing with a coarsely set plane. 25.

TRANI (Anc. *Turennum* or *Tranum*, and *Trajanopoli*). A town in the province of Naples. The harbour with good quays was constructed by the Venetians at the end of xv cent., and repaired by Charles III (1756-88). The castle was built by the emperor Frederick II (1210-50). It is the seat of an archbishop. The cathedral, dedicated to the Assumption of the Virgin, has a good crypt; the edifice, one of the remarkable mediæval monuments of South Italy, very much resembles in style the tombs near Cairo: interior modernised 1837: the steeple is over 260 ft. high. The bronze doors were by Barisanus, middle of xii cent.: having the inscription "Nicolaus sacerdos cs atq magister me fecit". The Templars had a hospital, of which an elegant little church with rich details, remains. There are about 20 parish churches. SCHULZ, *Denkm. der Kunst in Unter Italien*, 4to., Dresden, 1860. LE DUC DE LUYNES, *Mons. des Normands—dans l'Italie méridionale*, fol., Paris, 1844. S. NON, *Voyage Pitt. de Naples*, 5 vols., fol., Paris, 1781-6, iii, 36. FREEMAN, *Neighbour Lands of Venice*, 8vo., 1881. 14. 28. 50. 96.

TRANNELL. "A small trannell of iron, or a large nail ground to a sharp point, with which they mark the brick, either from a square or bevel, or a mould made of thin wainscot or pasteboard, to direct them in the cutting through"; MOXON, *Mechanick Exercises* (Bricklayer), 4to., 1700, p. 9-10.

TRANSENN. The Latin term for a cross-beam. See TRANSON.

TRANSEON. The short iron bar, below the STAYBAR of a window, passing from mullion to mullion, and to which the leadwork of the glass is secured. STANDARD. TRANSENUM. 16.

TRANSEPT. (It. *crociata*; Sp. *brazo del cruzero*; Fr. *croisée*, *transept*, *nef transversale*; Ger. *querbau*, *querschiffe*; William of WORCESTER uses *brachia*, the arms, or *cross eele*; LELAND *transseptum*; GROSE *transverse* or *cross*; and "north" or "south arm of the cross" is also written). In the early basilicas of S. Apollinare Nuovo, and S. Apollinare in Classe in Ravenna, there is no transept, only nave, aisles, and apse; and in Rome, S. Giovanni Evangelista. Sta. Maria Maggiore has transepts of same depth as aisles, while at S. Prassede the transepts project beyond; S. Paolo fuori le mura, and the Lateran church have a nave, double aisles, transept, and apse. The transept is that portion of a cruciform church which extends from north to south across the main body of the building, and usually separates the choir from the nave. The Saxon churches had not this feature. Romsey church, Hampshire, is usually stated to be the first church in England built in the form of a cross, at the end of the xi cent.; but Westminster abbey 1065 by Edward the confessor is older. At Westminster, Gloucester, and S. Alban's, the choir is west of the transept (DURANDUS, transl. 1843). There are superb western transepts at Ely, Lincoln, Canterbury, Durham, and Peterborough.

One transept only. The churches of Abbots Morton, Badsey, Elmley castle, South Littleton, Norton, Beshampton, Castle Morton, Cleeve Prior, Severn Stoke, all in Worcestershire; and many others.

Double transept; choir transept; (LORRAINE CROSS). S. Benoit sur Loire, *cir.* 1080; Cluny, *cir.* 1089; and Nivelles in Belgium; are the only known instances on the continent. Examples are more common in England; as Canterbury, Lincoln, Salisbury, Worcester, Rochester, Southwell, Beverley: rudiments of such an arrangement appear at Wells, York, Hereford, and Exeter. MARTIN, *Hist. de France*, iv, 338, mentions a similar but exceptional instance at S. Quentin, and observes that the choir transept is ordinarily found only in abbeys of a period previous to the Ogival style. Late Norman at Canterbury, *cir.* 1096; and York, *cir.* 1160; Early English at Lincoln, *cir.* 1186; Salisbury, *cir.* 1220; Beverley and Rochester.

East transept (Early English), equal in height to central aisle of presbytery exceptional, at Worcester cathedral; KING, *Cathedrals*, 8vo., 1867, p. 187.

Semicircular apse occurs at end: Cathedral at Noyon, Soissons, Tournay; church of S. Macaire near Bordeaux; S. Martin at Cologne, and S. Elizabeth at Marburg 1235-83; all erected during xii century or early in xiii.

Aisleless transepts: Canterbury, Norwich, Carlisle, Worcester, Gloucester, Exeter, Rochester, Kilkenny, Romsey, and Bristol; but the place of an aisle was ordinarily supplied by the erection of eastern apsidal chapels, or square, as at Exeter. At S. Patrick's is a quasi-aisle. S. Stephen at Caen, and at Canterbury is an internally formed lateral aisle. Scotland, like France, ordinarily presents only a quasi-transept.

Double aisles, at Winchester, Ely, York, Wells, and Byland abbey. At Melton church, Leicestershire, very rare in a parish church; ASSOCIATED SOCIETIES, *Reports and Papers*, 1865, iv.

East aisles for chapels: at Peterborough, Hereford, Lichfield, Selby, Whitby, Ripon, Lincoln, Roche, Jorevalle, and Howden. FREEMAN, in *Journal of ARCHEOLOGICAL INSTITUTE*, 1854, xi, p. 136-148; 169. Two eastern chapels occur at SS. Giovanni e Paolo at Venice; Sta. Anastasia, at Verona; three in the Frari

at Venice; five in Sta. Croce at Florence. In the VI century S. Germain built chapels in the transept of S. Vincent. These chapels were usually founded as sepulchral chantries, and supported by families of distinction, or by bequests of ecclesiastics. One of the compartments at Winchester retains its name of the *calefactory*, the place for lighting the censers: it is believed the Eucharistic wafers were also baked there. A stone *confessional* chair remains in the south transept of Gloucester. The *revestry*, as at Westminster, Gloucester, and Christchurch, was attached to the transept; it contained a press for vestments (one remains at Winchester), an altar, and a bell to announce the coming of the celebrant. At Christchurch are chapels two stories high; one in north transept may have been used by the master mason, or master of the fabric; TRACING ROOM. In the south transept are two apsidal chapels, one above the other.

Transept towers occur at Exeter and Ottery S. Mary, and in Cormac's chapel, on the rock of Armagh, consecrated 1134: at S. Stephen, Vienna; Narbonne; and Chalons-sur-Marne. At Angoulême there are towers at the ends of the transept. At S. Lambert's, Liège, the south transept had a tower; SCHAYES, iii, 136. WALCOTT, *Church, etc., Arrangement*, 8vo., 1861. *BUILDER Journal*, 1860, p. 797. WHEWELL, *German Churches*, 8vo., 1842, p. 115, 3rd edit. 1. 5. 17. 19. 25.

TRANSERMUM. The term used 1634-5 for the iron cross-bar of a window, in the Peterhouse chapel fittings; WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 8vo., Cambridge, 1886, i, 76. TRANSEON.

TRANSFER PAPER. Thin paper prepared on one side with a jelly of hard soap mixed with black, or powder of other desired colour; or the paper may be rubbed over with red or other chalk. When desired to be used the paper is laid on the drawing material and the design pressed through with a tracer. The soapy mixture is indelible, but the other may be rubbed off by bread as a chalk drawing. CALQUING.

TRANSITION; TRANSITION STYLE; TRANSITIONAL. Terms applied to a certain class or classes of examples in architecture, which appear to form a connecting link between two well-defined styles. At one time the term was retained only for that period in England being the transition from Norman to Early English comprising the reigns of Henry II (1154-89) and of Richard I (1189-99). ENGLISH ARCHITECTURE. The monasteries of the Cistercian order were most of them built at this period, and are therefore of extreme interest in demonstrating the various steps by which this change was brought about.

The Saxon towers raised after the Norman conquest, in the low town at Lincoln, furnish the best evidence of the independent existence of the Saxon style, from its continuance, for a time, alongside of that introduced by the conquerors. In this they are more valuable as transitional specimens than any others; Cox, *Seven Periods*, in *BUILDER Journal*, 1851, ix, 432.

"The change which the fashion of our national architecture was continually undergoing was gradual as well as constant"; SHARPE, *Classification of Mediæval Architecture*, in *BUILDER Journal*, 1851, ix, 557, who in his *Mouldings of the Six Periods of British Architecture*, 4to., 1871, ascribes the term "Transitional" to the dates 1145-90; illustrating it by New Shoreham, north and south sides of choir; Selby abbey church, nave; S. David's cathedral, nave and choir; abbey Dore, nave; Furness abbey, nave; Tynemouth priory, choir; Wells cathedral, nave; and Chichester cathedral, presbytery. Also his *Sketch at end of New Shoreham*, 4to., 1861, p. 7. To these works *The Handbook of English Archaeology*, 12mo., London, 1847, 5th edit., adds (p. 16), Buildwas, Wenlock, Fountains, Roche, Malmesbury, abbeys; S. Mary Shrewsbury; S. Mary Magdalene, Reigate, nave, Surrey; Ramsey, Huntingdonshire; Northbourne, Kent; towers of Broadwater, Sussex, and Eastry, Kent; S. Oswald, Durham; Shillingford, Berkshire, three doors; Stoneleigh, Warwicks, chancel and tower; Filey, Yorkshire; Ovingdean, Rodmell, and Piddinghoe, Sussex; Easton, Hampshire, apse with stone groining; and East Langdon, Kent. To the above is added as

ARCH. PUB. SOC.

dated examples (GODWIN, *English Architect's Handbook*, 8vo., Oxford 1867): 1155-77 Peterborough transepts; *cir.* 1160 Ifley church, Oxfordshire; 1160-80 Christ Church, Oxford; 1169 Llanercoast priory, Cumberland; 1174-89 Ely, nave continued; 1175-84 Canterbury choir rebuilt; 1177 Byland abbey, Yorkshire; 1180-97 Durham, galilee; 1180-1200 S. Thomas à Becket, Portsmouth; 1185 Temple, London; 1185-1200 S. Joseph's chapel, Glastonbury; 1174-96 Wells, nave and transepts. *Anglo-Norman Transition*, by PAPWORTH, in *ROY. INST. OF BRIT. ARCHITECTS, Proceedings*, 1888, p. 115; 177.

"The transitional style in England must cede to that of the continent as to priority; yet like its predecessor the Anglo-Norman, and its successor the Early English, it arrived at a higher state of refinement and completeness of character than its contemporary style in either Germany or France. It is more self-contained and harmonious than either"; SEDDON, *Transitional*, in *BUILDER Journal*, 1879, xxxvii, 535-7. "So far from being an exotic, the country appears to have been absolutely saturated with transitional buildings . . . and these . . . evince a degree of originality and a revelry in the new art which is perfectly charming, and display beauties wholly different from any I have seen in other countries," SCOTT, *Lectures*, 8vo., 1879, i, 122. SCOTT, *English Transition*, read at the Archaeological Institute at Canterbury in 1875.

Now it is considered that "there are three principal periods of Transition, viz., from the Romanesque or Norman to the Early English; from the Early English to the Decorated; and from the Decorated to the Perpendicular. Buildings erected at these particular times frequently have the features of two styles so blended together that they cannot be properly considered to belong to either; sometimes the details of the later style are associated with the general forms and arrangements of the earlier, and *vice versa*"; GODWIN who gives Early English transition to Decorated 1272-1307; and names many dated edifices erected within that period, but these require careful examination as to any Transitional features.

Several good transitional examples to the Perpendicular at the end of the reign of Edward III (*ECCLESIOLOGIST Journal*, No. 48, No. 12 new Ser.), occur at Wymington, Bedfordshire; Morley, Derbyshire; chancel of S. Boniface at Bunbury, Cheshire; great portion of Bristol cathedral; S. Nicolas, Lynn; and Campden, Gloucestershire (p. 30 of *Eccles. Handbook*). Perhaps one of the earliest and best authenticated examples of the transition to the Perpendicular period, showing a curious mixture of the two styles, is Edington church, Wiltshire, founded by bishop William of Edington in 1352-61; he died 1366 after having commenced the alteration of the nave of Winchester cathedral into the Perpendicular style. GODWIN gives also a list of dated examples 1377-99 as erected during that period, but the same care is required. The period between 1300-1460, called "Ornamented English architecture", has been divided by DALLAWAY and other writers into two parts, 1, 1300-1400 called "Transition style or pure Gothic"; and 2, 1400-1460 called "Decorated Gothic": the change, however, between the two is marked by such nice and almost imperceptible distinctions, that it is next to impossible to mark their boundaries with precision. SCOTT, in *Cat. of Architectural museum*, gives the following dates:—Transition, *cir.* 1160-1200 (Early English 1190 to *cir.* 1272), transition or Geometric Decorated to the Flowing Decorated during reign of Edward II (1307-27), and to the Perpendicular in latter part of the reign of Edward III (say 1367-77), almost completed by accession of Richard II (1377). SHARPE's Geometrical period is another class.

Transition, or assimilating, work during the mediæval period in England, is referred to in GWILT, *Encyc. of Architecture*, edit. 1888, p. 968-9.

In France; Montivilliers church, Normandy, 1116; a curious specimen of transition (?) from Norman to Pointed, traced by rev. T. W. WEARE, and compared with other buildings and with Christ Church cathedral, at Oxford, 1841. The church of Nôtre Dame

de Noyon 1131 has a strange mixture of round and pointed arches, perhaps a caprice of the designer; RAMÉE, *Histoire*, 8vo., Paris, 1843, ii, 182-3. "In Normandy, the Transitional epoch possesses very feeble interest and absolutely no claim to a distinct consideration. On overstepping the boundaries of this province, no matter in what direction, we discern abundant evidence of a mighty change in the spirit of architectural creations. We discover a class of monuments which conduct us by progressive gradations, from the first incomplete perception of a new principle of beauty disclosed in the Pointed arch, to a system full of harmony, splendour, and grace"; INKERSLEY, *Inquiry*, etc., 8vo., 1850, p. 12-17, who then enters into the details and dates of the buildings between 1119-63. "Transition fully established in France 1140," SCOTT, *Lectures*, 1879, i. FRENCH ARCHITECTURE gives further details of this period.

In Germany; the choir, of Münster Maifeld (or Meiland), with its five-sided apse is the best part of the church, being the very earliest transition from Romanesque to First-pointed. Examples of actual Transition are very rare in Rhenish Prussia; WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 75. WHEWELL, *Arch. Notes on German Churches*, 8vo., 1842, p. 94 of this edit. (not 78) gives a section on "Characteristic Details of Transition or Early German Architecture", in many pages: and writes "that the English and German architects beginning from the same point—the Romanesque, and arriving at the same result—the Decorated or Complete Gothic, should have gone by different roads, and made the transition each through a separate style, is a curious circumstance, and worthy of illustration. The general character of the style is rather Romanesque than Gothic, though it has pointed arches and various other Gothic elements. The general character of the Early English on the other hand is decidedly Gothic; and, indeed, it cannot be considered otherwise than as a fully developed Gothic style" (p. 92). The *liebfrauenkirche* at Trier is of five years' earlier date than Cologne cathedral; contemporary with these is Marburg in Hesse; Altenberg near Cologne; Esslingen on the Neckar; and the cathedrals of Amiens and Salisbury. GERMAN ARCHITECTURE presents further details. 17.

TRANSOM, transenna, trans-summer (It. *traversa*; Fr. *mencaume*, *croisillon*, *traverse*; Ger. *losholze*). A cross-bar or beam. The horizontal piece framed across a window generally used in the late Gothic, or Perpendicular period; and in the late domestic styles of English architecture, hence "a transom window". NICHOLSON, *Diet. of Arch.*, 1835, explains a window without a transom as "a clear story window". This term "transom" is used by sir C. Wren in his *Reports*, in *Parentalia*, fol., 1750, p. 302, 304, 307: by Godfrey RICHARDS, 1662, and PRICKE, 1670 (p. 2), "transoms or crosspieces of windowes"; MOXON, *Mechanical Exercises*, 4to., 1677, has "lintol—transom". STAY-BAR. SADDLE-BAR. TRANSEON. 16. 17. 19. 25.

The most ancient examples, yet rare, are found during the Early English period: they increased during the Decorated period, and were prominent during the Perpendicular period. In the Gothic on the Continent transoms were much less used. At Bolton priory, Yorkshire, the south side is presumed to be later than the north side, as the windows are tall, narrow, two lights of geometrical decorated date, arranged in pairs, and crossed by transoms, and considered to be original by WALBRAN, of Ripon; and therefore the earliest, and show how the floriated window in the choir and north aisle was invented; ROWE, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1881, p. 60. A lintel over an opening.

"Transome" is used probably for a screen behind an altar, the *reredos*; WILLIS AND CLARKE, *Arch. Hist. Cambridge*, 4to., 1886, ii, 576; and Glossary, iii.

The vane of an instrument called a "cross-staff", being a piece of wood fixed across with a square socket upon which this slides. TRANSPORTING WEIGHT. See MAT. MOVING.

TRANSTRA. The horizontal timber or tiebeam in the roof of a Roman building. 17.

TRANSVERSE RIB (Fr. *arc doubleau*). A rib in vaulting, so called by WILLIS; it is usually called CROSS RIB, and "arch rib", while "master rib" has been proposed for it. SCOTT, *Lectures*, 8vo., 1879, ii, 182.

TRANSVERSE SECTION. A drawing showing the interior arrangements on a vertical plane taken generally in a straight line through the greatest width of a building; sometimes the line is made to deviate so as to authorise the representation of any particular part not coming in the direct line. This line is generally dotted; or drawn in a different-coloured ink on the various plans, and lettered A—B, or others, and referred to by letters at the bottom of the section.

TRANSVERSE STRAIN or LATERAL STRENGTH. The strain applied against a piece of timber or stone. STRAIN or STRESS. GIRDER. In 1850 it was stated that experiments on the lateral strength of timber were made in abundance, but not on stone; W. STEWART supplied some on Stourton and Wingerworth stones, redstone from south side of river Dee, Yorkshire flags, and Bangor and Llangollen slates; in *ARCHITECT Journal*, 1850, ii, 329; and CIVIL ENGINEER, ETC., *Journal*, xiii, 269. It is rarely that stone is placed to such a disadvantage for any long span, as the cohesive power of stone is seldom tested; ARCHITRAVE; FLAT ARCH; JOGGING. Marble beams in temples occur as much as 18 ft. in the clear; GWILT, *Encyc.*, edit. 1888, § 1502r, or p. 397; and p. 586.

TRANSYTE. A narrow passage. TRAVERSE. TRESAUNS. 17.

TRAP. A contrivance to prevent the escape of foul air from a drain or cesspool, into the house, or where it may be an inconvenience. A trap is also used to prevent the ingress of sewer rats, and to prevent solids and other substances passing into the drain. It often fails, or is supposed to do so, in dry weather, because the water in the trap has dried out; also as the air in the drain is liable to expansion from various causes, it occasionally displaces the small quantity of water and escapes into the house, and being foul is the source of annoyance, if not of sickness. Hence the introduction of the "intercepting trap", which being capable of ventilation by a grating, or by a pipe carried up to a height, is usually effectual in preventing this ingress of foul air. Another method is to insert the end of a pipe into the highest part of a drain and so carry off the foul air. There is much controversy at the present time as to whether this pipe may be of a moderate diameter, say 2 to 3 inches, or should be of a bore equal to the drain itself. Other authorities say that the ventilating pipe of a drain is of little use if it be less than 4 ins. diameter; a greater size, or even a bore equal to the drain itself will be more effectual. Others again say, it is not the sewer that is to be ventilated.

The modern inventions of traps date from about 1844, when glazed stoneware was manufactured. Among the innumerable inventions of this sort treated in this work are: AIR; BELL; "D"; DIP; DRAIN; GREASE; GRID; GULLY; ICEWELL; INTERCEPTOR; "P"; "S"; SINK; SOIL; STENCH; STINK; SYPHON; also the articles CESSPOOL; DISCONNECTING; OUBLETTE; PITFALL; RAT; VENTILATING.

TRAP (Fr. *trappe*, the space outside and between the slopes of an "M" roof; Ger. *treppel*), hence TRAP DOOR. A flap, hinged or loose, formed in the ceiling of the top floor, for access into the roof, or into the gutter of the roof for repairs, by means of a dormer, or trap, door formed in the slope of it. This is an important arrangement as a means of escape in case of fire, but is usually rendered abortive from the use of a ladder (not being kept in place) instead of a flight of stairs, as found in many old houses. A *lucarne* in a corn-mill requires self-acting trap-doors. A flap in a floor, to cover an opening up which goods are raised; also in a floor or pavement for access to a vault or basement. The external staircase to the first or upper floor of a house of the XIII cent., was the usual access; at West Deane rectory-house is a newel stair at one angle; another mode was by a trap-door, as it was by means of a "trapa descendus" that Henry III passed from his chamber to his chapel or oratory, at

Clarendon; this he ordered to be removed and a spiral stair to be constructed at one angle instead; TURNER AND PARKER, *Dom. Arch.*, 8vo., 1851, i, 84-5.

TRAPANI (Anc. Drepanum). A seaport town of Sicily; erected B.C. 260 by Hamilcar Barca, who had destroyed Eryx, now Mount S. Giuliano, the loftiest in the island, and where the remains of the famous temple of Venus Erycina still exist. The place d'armes was made by Charles V; its wall remains. Abundant relics of domestic architecture of the middle ages dating from the Norman or Aragonese monarchs, are to be seen. There are no less than 51 churches, with numerous (were 14) monastic institutions, none of much merit. The cathedral or collegiate church, dedicated to S. Lorenzo (Italian). S. Pietro apostolo; a large edifice (Italian). S. Agostino monastery; formerly Knights Templars. S. Domenico; Norman, round window. Collegio de Gesuiti; one of the largest and best (Italian). S. Giovanni; a large domed church. Sta. Maria di Gesù (Italian). S. Pietro convent, has large pointed windows. La Trinita (Italian). S. Nicolo di Bari, erected by Belisarius. Three hospitals; the *Vecchio* and picture gallery; casa comunale, Italian of three orders, its façade with statues; a large theatre; several palazzi; a royal college; and the palace of the provincial assemblies, a good edifice, are noticeable. SAMMARTANO e SALERNO, *Saggio storico-sul monte Erico, sua città, e suoi d'intorni*, 8vo., Paler., 1826. SCASSO BORRELLI, *Geog. dell' Isola di Sicilia*. 14. 28. 50. 96.

TRAPEZON (Gr. τραπεζαίον). A flat square stone, called *mensa* by CICERO; used as a monument or tomb over a grave. 78.

TRAP ROCK. From Gr. *treppe*, meaning steps, from the aspect of the rocks in successive terraces on hill-sides. It has been applied to the ancient rocks of fusion as they appear under particular relations of position or geological age. It is also applied to interposed beds, or overlying masses; and appears to be a collective term more convenient than precise. Geologically it may be replaced with—"irruptive", "interposed", "overlying"; and mineralogically it is well changed for basalt, greenstone, felsparite, sienite, serpentine, diallage rock, and others.

TRASCORO. The *coro* or choir proper, of a Spanish cathedral, is transferred to the eastern half of the nave; the portion of the nave outside, i.e., westward, is the *trascoro*; and to the east of it the *entre los dos coros*: in most great churches the crossing *crucero* and the transepts do the work of the nave in the way of accommodating the people; STREET, *Gothic Arch. in Spain*, 8vo., 1865, p. 16.

TRASS; TARRAS; Terras; see TARRAS.

TRASURA and intrasura. A PATTERN or drawing on boards made previous to cutting them out for workmen to work stone. Accounts of S. Stephen's chapel, 4 Edward III, 1330-31; SMITH, *Westminster*, 4to., 1807, p. 181-2. 16. 19.

TRAU, Traghu, Tragur, Trogir (Lat. Tragurium). A town of Dalmatia, on an island of the same name, 30 miles from Spalato. Old walls and fortifications; a round tower on north-west side 1378; old houses in narrow streets, having balconies after the Venetian manner; the castle Camerlengho 1420-24 by the Venetians. The bishopric was suppressed 1822. The ex-cathedral dedicated to S. Lorenzo, built about 1213-51 (Lombardic-romanesque) is the finest church of XIII cent. in Dalmatia. Above a west arcade or porch rises the campanile of two stories having the flat surfaces pierced into open quatrefoils; the spire was completed 1698. A richly carved west door. The vaultings of the porch are all rope mouldings; at the end of it is the baptistery 1467, having a frieze of cupids, and vaulted like the temple to Æsculapius at Spalato; built by A. Alecci or Alessi, of Durazzo, who also did 1468 the sumptuous chapel to S. Giovanni Orsini, bishop 1062 of Traù. The pulpit, and stalls of black oak deserve attention. The north transept is singularly decorated with numerous fat cupids, and the roof is covered with a diaper of cupid's-heads. Out of about 32 churches there are only three for notice, Sta. Barbara; S. Nicolas; and S. Giovanni Battista, the finest, but the walls only are standing; also three monasteries, a gymnasium, hospital, with

a loggia or broletto between portions of old Roman and Venetian work. CASSAS, *Voy. Pitt.*, etc., Istrie, fol., Paris, 1802, p. 114. STRANGFORD, *Eastern Shores of the Adriatic*, 8vo., 1864, p. 247-9. FREEMAN, *Neighbour Lands of Venice*, 8vo., 1881. JACKSON, *Architecture of Dalmatia*, in Roy. Inst. of British Architects, *Transactions*, 1886-87, p. 172, with plate of doorway; and his *Dalmatia*, 8vo., London, 1887.

The palace at Spalato was built of a beautiful freestone from quarries at Tragutium (modern Traù) little inferior to marble; GIBBON, *Decline*, etc., 8vo., edit. 1853, i, 465. 14. 26. 28. 50. 96.

TRAVELLED EARTH. Earth deposited on the natural soil; term used at Edinburgh.

TRAVELLER; TRAVELLING CRANE. A very useful machine for hoisting materials in the erection of a building. It consists of a crab fixed on a carriage, which is movable upon rails to any part of a building where it may be required, so that heavy materials can be moved about with ease and precision. "Overhead steam traveller", and "Hand traveller" for stone yards, etc., are similar machines. The travelling concrete stage, Main Drainage works, is given in *BUILDER Journal*, 1862, xx, 242. CRANE. DERRICK. SCOTCH SCAFFOLD.

TRAVERS (SAMUEL); surveyor-general 1705-10, supervised the erection of Blenheim; Accounts in sir John Soane's museum. He was removed 1710 from office, and was succeeded by ... Manley; THOMAS, *Hist. Notes*, 8vo., 1856, ii, 950; 1013. "1725 Sept. 17, died S. T. esq. auditor general to H.R.H. the prince of Wales, and clerk of the king's works"; *Historical Register*, p. 42; he was succeeded in the first post by William Clayton (p. 44). Possibly father and son.

TRAVERSE. The head of a door-dressing, i.e., the transverse or horizontal architrave. A gallery, or loft of communication (Fr. *traverse*), such as is found in large churches. TRANSYTE. TRESAUNS. 19.

A kind of screen with curtains, used in halls, chapels, and other large rooms, to give privacy to dignified persons; the following are some references to the use of the term; others are given in the GLOSSARY OF ARCHITECTURE:—"1498-99, 14 Hy. 7; To William Este, mason, for vawting the *trevisse* over the conduytt (? at Wodstock), £10: 0: 0"; British Museum, *Add. MS.* 7099. Henry VIII, 1520-21, "erected a lodging at Guisnes—a chapel with two closets—in the first closet was a trauerse for the king's person, of cloth of gold—before the trauerse was an altar of presence—the second closet was for the queene's person, in which was a trauerse of rich cloth of gold, the altar so richly apparelled that there lacked neither pearls nor stones of riches"; HOLINSHED, quoted in HUNT, *Tudor Architecture*, 4to., 1836, p. 184. "A place—with *travers* and curtens"; CAMDEN SOCIETY, *Rutland Papers*, 1842, p. 23; 123. "The queen following and going into her *travys* under the canopy"; PECK, *Desid. Curiosa*, edit. 1779, ii, 265. "After he had entred the quere and perceived the moste holy sacrament, he put of his cap and went bare headed with great humilitie, until he entred his seate or *travers*, as they call it" (p. 140): "They arose and the queene went to a seat or *travers* on the right hand of the altar" (p. 142); and "Dined under the cloth of estate" (p. 143); CAMDEN SOCIETY, *Chronicle of Queen Jane*, by J. G. NICHOLS, 4to., 1850.

A transept is called a traverse, by GROSE, *Antiq. of Scotland*, 4to., 1789-91, Elgin, ii. TRAVICE. 17. 19.

To plane a board in a direction transverse to the fibres, in order to straighten it in that direction; MOXON, *Mechanick Exercises* (Joinery), 4to., 1701, p. 65.

A house in a street which leans or jutties out further than those that be about it; COTGRAVE; given in WILLSON, *Glossary to PUGIN, Specimens*, etc., 4to., 1822.

Traverse, or trevice, boarding; a term used in Northumberland.

TRAVERTIN; travertino; Tivoli stone. The Italian term for a solid concretionary limestone produced from springs holding carbonate of lime in solution, formed in lakes and on hill-sides. This accumulation in great quantity appears to be often associated with centres and lines of ancient volcanic

excitement, or with great natural fissures of the strata. The Roman material was derived from the quarries at Ponte Leucano. **CALC SINTER.** In the constructions at Rome was first used the soft, brown-coloured, volcanic **TUFA**; next, the harder volcanic stone, now called **PEPERINO**, anciently lapis Albanus and lapis Gabinus; and thirdly the harder and more valuable "travertine", called lapis Tiburtinus (from near Tibur, now Tivoli), which came in gradually, and appears to have been very rarely used before the first century B.C., and then only for arches, piers, flat arches, keystones, and other points of special constructional importance. Three examples of its use are given in **MIDDLETON**, *Chief Methods of Construction used in Ancient Rome*, in *Archæologia*, 4to., 1888, li, 45-7, figs. 5, 6, and 7. He mentions that "when a wall is partly built of travertine, the adjoining blocks of tufa or peperino are no longer worked to the regular 2 feet courses, but they range with the travertine blocks, which are never cut to regular sizes, probably to avoid waste both of labour and material in cutting up the harder and more costly stone." **PARKER**, *Archæology of Rome*, 8vo., 1874, i, states that the earliest example known of the use of travertine is at the tomb of Cecilia Metella, and there it is merely a veneer over a rubble wall of enormous thickness, dated 103 B.C.; others say 50 B.C. Beds of travertine are well seen at S. Vignone, in Tuscany. **LYELL**, *Principles of Geology*, b. 2, chap. 3, fully describes these calcareous deposits. **CHIUSI.**

TRAVICE, **TREVIS**, and **Trevice**. A small enclosure, or oblong quadrangle, consisting of four posts kept together by cross-poles, for holding restive horses, while shoeing. **KNIGHTLEY**, *Stable Architecture*, fol., 1862, pl. 25.

TRAVIS, **trevis**, or **trivess**. A partition or division to a stall in a stable. **LOUDON**, *Encyc. of Cottage, etc., Architecture*, 8vo., 1833, § 1103. Probably from *Fr. travée*, a bay of joists; the space between two beams.

TRAY (*Ger. trag*). A quantity of lime, perhaps equal to 8 or 12 bushels. **SEME**. **HOD**. 1487, a tray of lime 14d. to 16d.; a tray of sand 4d. In 1532 a tray cost 24d. and 21d.; half a "seme" was 8d. In 1550 a bushel was 4d.; **NICHOLLS**, *Illustrations, etc., of England* (Churchwardens' Accounts of Wigtoft, co. Lincoln), 4to., London, 1797, p. 82. "Treys" occurs in the accounts of Mettingham college, Suffolk, 1405-24, in *ARCHÆOLOGICAL JOURNAL*, 8vo., 1849, vi, 68. "Oak tray, ash trays with oak heads, larch trays with oak heads", etc., were for sale near Lincoln, in 1867; probably "a local name for a hurdle or a lifting field-gate without hinges".

TRAYLE; **TRAYLER** of levys; see **TRAIL**.

TRAZZO FLOOR; see **TERRAZZO VENEZIANO**.

TREAD (*Fr. giron; emmarchement; It. lunghessa; lasghessa; predata; Sp. pisa (?)*; *Ger. stufen-breite*). The flat part of a **STEP**, which consists of a riser and a tread; when ornamented it has a moulded nosing. The riser and tread of a **STAIRCASE** should be proportioned one to another for easy going. **GWILT**, *Encyc.*, edit. 1888, p. 668. **GEOMETRICAL STAIRCASE.** Portland stone is often too soft to withstand the use and wear of constant traffic; Craigleith stone is harder without being slippery, and is more durable though dearer. The worn-out stone tread is then often replaced with iron; or wood, as *lignum vite*, or pitch pine, with the fibres set upwards in an iron frame, as Hawksley's patent treads, January 1870, to be seen at many of the stations of the Metropolitan railway. A brass edging is also used; or the tread covered with 7 lb. lead, which is often worn through in six or seven months. Chequered iron plates have been used but they soon wear smooth and become slippery. In 1869, mons. Cazeau put a durable covering by thin plates of aluminium bronze. In a factory he found that treads of common bronze $\frac{1}{2}$ in. thick were worn out in six weeks, while plates of the other $\frac{1}{2}$ in. thick were as good as new after 11 months' wear; this bronze is composed of copper with from 8 to 10 per cent. of aluminium. He proposed to try it on the steps of the column in the place Vendôme. Hembry and Co.'s 1881 patent india-rubber stair clips and treads, are said to be durable, noiseless, and secure. Lindsay's

patent reversible treads 1880, used at the New Courts, Lincoln's Inn: brass or iron nosing of the tray filled in with wood blocks of oak, elm, teak, or jarrah. Doulton's Silicon tread, 1883, the hard wear of two seasons at South Kensington has stamped this invention as a valuable one especially for outdoor, and rough, use. Elsley's hard rolled metal stair tread, of brass or bronze, being deeply fluted on the upper side, gives a firm foothold.

When treads are covered with a carpet it has to be secured by rods usually of plain round brass, also twisted, and if very long of triangular shape for strength. The rods are run into "eyes" fixed into the angle where the tread and riser meet. The common form was a brass screw with an eye; later the eye has been cast on a sort of angle bracket, which has a pin under one end to fasten into the tread, and a hole at the other end for a screw to go into the riser; a stronger and larger sort has a screw at each end. 1860 Farmer and Hardy, stair rods and eyes; *BUILDER Journal*, xviii, 15. Hunter and Hylands' registered brass stair rod eyes 1884 has the eye to open to receive the rod.

TREASURY (*Lat. gazophylacium; Fr. trésor*). A building where money and other valuables are kept. In historic times, the public treasury was either in a building attached to the agora, or in the **OPISTHODOMUS** of some temple (*Gr. thalamoi*). **THESAURUS.** The **ÆRARIUM** of the Romans.

MYCENÆ; of Atreus; **DODWELL**, ii, 230. **LEAKE**, *Peloponnesica*, 8vo., 1846, p. 254-5. **STYRA.**

ORCHOMENOS; of Minyas; **DODWELL**, ii, 227; and *Cyclopiæ Remains* **SCHLIEHMANN**, *Explor. of the Boeotian Orchomenus*, 8vo., 1881.

Near Sparta. Another at Vaphio or Vaphos. **LEAKE**, *Pelops*, 8vo., 1846, p. 354.

PHARSALIA, in the citadel; **DODWELL**, i, 228.

AMYSIA; of Menelaus; **DODWELL**, ii, 414.

MADAYN or **MADAIN**; of Chosroes.

OLYMPIA; had twelve thesauri built by different cities; each in the form of a small temple "in antis", from that of Myron of Sicyon, about 650 B.C. One for the Carthaginians, designed by Pothæus, Antiphilas, and Megacles. Another for the Epidamnians, by Pyrrhus, Lacrates, and Hermon. **LEAKE**, *Pelops*, 8vo., 1846, p. 39, 73, 85.

LIVADEA; of Hyricus, plundered by its architects, Agamedes and Trophonius. Of **RHAMSINATUS**, king of Egypt, plundered.

SYRIA; in the chief towns in every province, the public treasure is kept in the great mosque, it being placed in a chamber supported upon pillars. At Damascus; on the right or western side of the court is the treasure-house (*Bait mall*) raised on eight columns, finely ornamented, and the walls covered with mosaics; **MUKADDASI**, *Descr. of Syria*, cir. 985, 8vo., 1886, p. 18, 75.

At Denderah, under the temple are long, narrow, secret corridors intercalated into the thickness of the foundations and of the inner walls of the temple—perhaps secret hiding-places, as they had neither doors nor windows, nor opening of any sort, and when they were entered it was only by some special mechanism that the stone which mysteriously blocked up the entrance could be removed. They contained treasures, etc., as recorded in the inscriptions in them; **MARIETTE**, *Monts. of Upper Egypt*, 8vo., London, 1877, p. 135-7. **A. B. EDWARDS**, *Up the Nile*, 8vo., 1877, ii, 561. Treasure chamber of temple at Curium; **CESNOIA**, *Cyprus*, 8vo., London, 1877, p. 303.

The treasury, sometimes called the re-vestry, was generally near to, or as at Westminster below, the dormitory: sometimes near the choir, as at Canterbury; in the south transept at Chichester; there is frequently a deep recess in a crypt to hide the sacred plate in time of danger, as at Canterbury. At Clermont, Limoges, and Narbonne, the treasury and sacristy occupy two of the choir chapels; **WALCOTT**, *Church, etc., Arrangement*, 8vo., 1861. *The treasury or muniment room and chest*, an essay by **WILLIS** and **CLARK**, *Arch. History of Cambridge*, 4to., 1886, iii, 472-84. **VIOLLET-LE-DUC**, *Dict. Raisonné*, s. v. **LENOIR**, *Arch. Monastique*, 4to., Paris, 1852-56, iii, 204-292. At Durham, "In the west alley of the cloysters . . . is a strong house called 'the treasury', where all the treasure of the monastical house was deposited, having a strong door and two locks upon it"; **DAVIES**, *Ancient Rites*, 12mo., 1672, p. 98. The room over the north porch of Hawkhurst church, Kent, was called the treasury, and

still contains a chest therein; and the room over the outer porch at Redcliffe church, Bristol. At Westminster abbey, the monastic treasury was under the old dormitory, and is now the chapel of the Pix, occupying two bays of Edward the Confessor's work; the crypt under the chapter-house was the royal treasury, where the regalia and stores of money were kept.

Merton college, Oxford; 1310 a stone-roofed fireproof room of two floors; TURNER AND PARKER, *Dom. Arch.*, 8vo., 1853, ii, 193.

Worcester cathedral; WILLIS, in ROYAL INST. OF BRIT. ARCHITECTS, *Seasonal Papers*, 1862-63.

Old Cleeve abbey; WALCOTT, *idem.*, 1875-76, p. 109.

Windsor; St. George's chapel; groined roof of Egrement stone, 1365-67. Oxford, New college; by Wykeham, who 1400 introduced the treasury into the collegiate plan.

Canterbury; first floor adjoining S. Andrew's chapel; WILLIS, *Christ Church*, 8vo., Oxford, 1845, p. 77-9.

Maastricht, in Notre Dame; HAVARD, *Pict. Holland*, 8vo., 1876, p. 384.

CHARTERHOUSE and ROOM. MUNIMENT ROOM. RECORD OFFICE. 19. 25.

TREBLES or Lattens. Iron sheets.

TRECENTISTI. The great artists of this period in Italy are Cimabue (1240-1302), Nicolo Pisano (1206-78), Giotto (1273-1336, Orgagna (1316-89), and others. CINQUE CENTO. ORNAMENT.

TREDGOLD (THOMAS), C.E., born about 1788 at Brandon, near Durham, was brought up as a carpenter. In about 1813 or 1814 he went to London, and was in the office of the architect William Atkinson for about ten years. It is stated that before 1811 he had built a small barrack at Hampton Court, one of the first buildings erected by contract. He published *Elementary Principles of Carpentry*, 4to., 1820; 1828 (the examples were partly taken from DUMONT, *Parallèle*, fol., Paris, 1767); new edit. 1840, and 1853 by BARLOW; and revised by HURST, 1871: *Treatise on the Strength of Cast Iron*, 8vo., 1822; 1824; 4th edit., 8vo., 1842, and 1860, by HODGKINSON; *Principles of Warming and Ventilating Public Buildings*, etc., 8vo., 1824; App. by BRAMAH, 1836; and other publications on Railways, etc.; with *Treatises on Joinery and Stone Masonry*, in *ENCYCLOPÆDIA BRITANNICA*, 8th edit., 1857; wherein is a memoir of him. He died January 28, 1829, aged 40, and was buried in S. John's wood chapel cemetery. ARCHITECTURAL MAGAZINE, 8vo., 1834, i, 208. ALLGEMEINE BAUZEITUNG, 1838, p. 313. 14. 68.

TREDYL or stair; see GRE, and TREAD.

TREE. The name often applied in Scotland to a BALK of timber.

TREENAIL or TRENNEL; see TRENAIL.

TREE POST. See KING POST.

TREE WORSHIP. FERGUSON, *Tree and Serpent Worship, or Illustrations of Mythology and Art in India, in the I and IV Centuries after Christ*, from the sculptures of the Buddhist Topes at SANCHI and AMRAVATI, 4to., 100 plates, 1869; 2nd edit., 1873. A volume of 46 pl. was issued fol., 1868. *Phonician Art*, in DALY, *Revue Générale*, 1841, ii, 498. MANNHARDT, *Wood and Field Worship*, Berlin, 1875. PALMETTE. SERPENT WORSHIP.

TREFOIL (It. *trifoglio*; Sp. *trébol*; Fr. *trèfle*, *trilobe*; Ger. *dreipass*). An ornament formed by mouldings so arranged as to form the "trefoil" or three-leaved clover (trifolium) or three cusps in a circle. CINQUE FOIL; CUSP; FOIL; FOLIATION; QUATRE-FOIL; SHOULDERED ARCH. The trefoil as used at Murano is explained and drawn in RUSKIN, *Stones of Venice*, 8vo., 1867, ii, 42, where "it is five or six hundred times repeated, hardly ever twice the same size".

The lancet arch requires a counterfort of some character. Where great counterfort cannot be given, a principle was carried out in 1853, by J. Derick, at the Bruen Testimonial church, at Carlrow, "which consists in the connection of a trefoiled arch within a simple lancet arch, the radiation of the voussours being to the centres of the several curves. The voussours which compose the trefoil being common to those composing the lancet, and the trefoiled arch exercising a force within the building which neutralises the outward thrusting force of the lancet arch,

ARCH. PUB. SOC.

the two forces produce a state of rest"; a diagram is given in *BUILDER Journal*, 1854, xii, p. 34. PRINCIPAL.

A trefoiled Romanesque arcading (uncommon) at Bourges; MAGAZIN PITTORESQUE, 4to., Paris, 1833, i, 172-179; and GAILHABAUD, *Monumens*, 4to., ii. Another example is in *Instructions du Comité Hist. des Arts*, etc. (Arch. religieuse), pt. 2, p. 42. An early example of a trefoil-headed arch is seen on a capital carved to commemorate a gift by king Rufus to Westminster abbey; BRAYLEY AND BRITTON, *Westm. Palace*, 8vo., 1836, p. 445-6; 463. 1. 14. 19.

TREILLAGE; see TRELLIS and TRILLAGE.

TRELLASDOME. "In the entrance of the end of the said north alley, into the said Lantern alley, from pillar to pillar there was a trellas dome"; DAVIES, *Rites of Durham*, 8vo., 1672, p. 64. 16.

TRELLIS, Trellice (Fr. *treillage*; *treillis*). A framework formed by laths placed a short space apart, and fixed diagonally, on which climbing plants are trailed. A stone moulding in Norman work, carved diagonally or lozengy, as at the doorway of S. Peter's church, Northampton. A studded trellis is seen at Malmesbury abbey. The raised "trellis work" of the masonry of the central gable (purest Early English) at Lincoln cathedral; as also in the interior of the tower; also the arch on either side of the great west window as well as the splays of the window itself, are covered (inside) with trellised ornament; KING, *Eastern Cathedrals* (Lincoln), 8vo., 1862, p. 273; 282. The term "trellice door" occurs in DAVIES, *Ancient Rites of Durham*, 12mo., 1672, p. 49. In Hindostan, this kind of work is called JALI or Ziniri; KITTOE, *Indian Architecture*, fol., Calcutta, 1838.

FRET. GRILLE. RETICULATED TRACERY. PIERCED WORK. TRILLAGE. 16. 19. 25.

"Trellis work" is shown in many books on gardening issued in the last century; as BLONDEL, *Maisons de Plaisance*, 4to., Paris, 1738, ii, 14. D'AVILER, *Cours d'Architecture*, 4to., various editions from 1691. LANGLEY, *New Principles of Gardening*, 8vo., 1728.

Trellage, is applied to a basement story of rusticked work, at Amptill, Bedfordshire; in NEALE, *Seats*, 4to., 1818, i.

TRELLIS BEAM or girder. A construction of cast iron first prepared for the exhibition building of 1851. Those for the building of 1853 in Dublin were of malleable iron using the flat bar, angle L, and T forms; experiments are recorded in FAIRBAIRN, *Application of Cast, etc., Iron*, 8vo., 1857-8, p. 119.

TRELLIS BRIDGE; see LATTICE BRIDGE. Further references are, SMILES, *Life of Smeaton*, 8vo., 1874, p. 361. The Donau bridge at Stadlau, in ALLGEMEINE BAUZEITUNG, 1870, pl. 64-77. The article "Bridge" in PENNY CYCLOPEDIA, Supp., 1858, p. 82. Riveted lattice bridge of America, in *BUILDING NEWS Journal*, 1879, xxxvi, 504, giving a good list. Charing Cross railway bridge, by Scott Russell at the BRITISH ASSOCIATION, Cambridge, 1862.

TREMAIRE BLUE. A very good preparation of ultramarine, invented by a Frenchman in 1809.

TREMBLAYE (GUILLAUME DE LA), designed 1704-26 the modern buildings of the abbey of S. Etienne (abbaye aux hommes), at Caen, in Normandy, formed since 1800 into the collège; those of S. Trinité (abbaye aux dames) converted since 1823 into a model hospital; and part of those of the abbey of S. Denis. He died 1715. LA RUE, *Nouveaux Essais hist.*, —de Caen, 8vo., 1842, ii, 422.

TREMIGNAN (ALESSANDRO), of Venice, also a sculptor, carved 1683 the statues at, and designed, the church of S. Moisé (pl. 14), completed 1688; the church di S. Tomaso (pl. 28); and palazzo Fini, on the canal grande (pl. 64); all poor Italian. CARLEVARI, *Fabbriche di Venetia*, obl. fol., Ven., 1703. SELVATICO, *Venezia*, 8vo., 1847, p. 430. He is also called Tremiglione in some works. 5. 68.

TRENAIL, treenail, and trennel; also "treene nail" of *Statutes at Large*, p. 198, col. 5. (Fr. *cheville*, *brandir*, *cherche*, *cheville*). A cylindrical pin of wood, of a length proportionate

to its duty, used in securing the pieces in timber framing: and used in situations where iron bolts are considered objectionable. **DRAWBONE PIN.** **FOXTAIL WEDGING.** Nearly all mediæval timber work was put together with oak trenails. The wood of *Robinia pseudacacia*, locust wood, is almost set apart for trenails; also the *Bassia*, of the East Indies. **BLACK**, *Account of the proposed mode of combining timber by dovetail tree nails*, 8vo., London, 1797. Trenails, double dovetailed, are shown at D in figure s. v. Dovetail, and explained. Trenails are used to fasten railway chairs to the sleepers; and are formed of heart of oak cut in the direction of the grain, and compressed by steam. It is reduced in volume about 63 per cent., by which its transversal strength is increased nearly 50 per cent. **BREES**, *Glossary*, 8vo., 1853, p. 451, gives a diagram before and after compression. **INSTITUTION OF CIVIL ENGINEERS**, *Proceedings*, 1842, p. 73-9; xi, 256-7; Ransome and May's railway key and trenail machinery; *idem.*, xvii, 24, 32, 42-3.

TRENCH (F.); see **JOHNSTON (RICHARD)**.

TRENCH. In military work, an excavation from 12 ft. to 18 ft. wide and 3 ft. deep, and generally of considerable length, the earth being thrown up on one side to form a parapet by which the men in the trench may be covered from the view, or protected from the fire, of the enemy. A trench is formed for the foundations of a building; also for a sewer or a drain; the ground will have to be properly strutted and planked to prevent it falling in, if it be loose, or the cutting deep.

A trench for laying water or gas pipes will require to have 6, 8, 10, or more inches space on each side for making joints, and for the earth to be properly rammed in. In refilling a trench, the soil put in, in 6 to 12 inch layers, should be well punned with an iron punner of not less than 10 lbs. weight. Care should be taken not to break the pipes; and it is sometimes better to lay in the filling-in loosely so as to act as a drain for any water in the soil to escape to an outlet.

Trenching or guttering land is draining it with open drains.

TRENCHING in farming, is digging two spits deep and bringing the subsoil to the surface. "Bastard trenching" is digging a trench one spit deep, and instead of throwing up the second spit, it is dug and left in. It should always be so done if the second spit be worse soil than the first.

TRENCHER CAPITAL. A capital square on plan with a square abacus.

TRENDALL (EDWARD W.), 1829, designing the grand-stand in the racecourse at Epsom; it is 156 ft. by 70 ft.; **BRAYLEY**, *Survey*, 4to., 1841, iv, 373-4. He published *Original Designs for Cottages and Villas*, 30 pl., 4to., 1831; *Examples for Roofs for Stables, Cottages, Schools, etc.*, 20 pl., 4to., 1843; *Examples for Ext. and Int. Finishings*, fol., 1848; and *Monuments, Cenotaphs, Tombs, and Tablets*, 4to., 30 pl., 1850 (1858).

TRENDING. The act of slipping or sliding one way.

TRENTO (Lat. Tridentum; Engl. Trent; Ger. Trient). A town in the Austrian Tyrol, situated on the river Etsch or Adige, here crossed by a timber bridge. The extensive castle is much ruined. There were formerly thirty towers. The city walls dating from the time of Theodoric are very perfect. The streets mostly wide, have channels for water to constantly pass along them; a good marble fountain is in the principal square. The town was the see of a prince-bishop 1027-1803, now of a bishop. The cathedral dedicated to S. Vigilius, having Romanesque features of VII or VIII century, was commenced 1212, of which date is the crypt under the choir, and completed early in xv cent.: **WEBB**, *Cont. Ecclesiology*, 8vo., 1848, p. 241, states "begun 1022, finished 1128, new choir 1205", copying from **GALLY KNIGHT**, *Eccles. Architecture*, fol., 1854, ii, 15. The high altar is placed beneath the cupola. The double colonnettes linked together in the porch to the south transept, appear also at the west porch of the church of S. Quirico, near Siena. The chapel of Sta. Croce was designed *cir.* 1682 by G. Alberti. Of the other fifteen churches may be mentioned Sta. Maria Maggiore, of red marble, rebuilt 1520 by R. Vantini; the south porch and tower remain of the older

church; the organ gallery 1534 is a fine work by V. Vicentini: S. Pietro, façade restored 1850: S. Apollinaris has Roman remains in it: the church of the former Jesuits (parts by A. Pozzo), now of the seminary, is profusely decorated with marbles; and dell' Annunziata, the lofty dome of which is supported by red marble columns each of one block. There are also three monasteries and a nunnery. Amongst the public edifices are the castello di buon Consiglio, the episcopal stronghold during the middle ages, much dismantled, and now a fortified barrack; portions are attributed to A. Palladio, San Michele, and to Falconetto. Another episcopal castle outside the town is in ruins. There is a good court-house, a large town-house, a large theatre; a number of palazzi, as palazzo Zambelli detto Galasso, casa Tatarelli da Fatis, or Tertaga Tabarelli, of red marble, which is by Lazzari; with others having fresco façades; a school of design, gymnasium, and hospitals. **MARIETTI**, *Trento, sue vicinanze, etc.*, Trento, 1836. **FREEMAN**, *Historical Sketches*, 8vo., London, 1876. 14. 28. 50. 96.

TRESAUNS, **TRANSYTE**; see **TRISANTIA**.

TRESHAM (sir THOMAS), or **Tressam (WALPOLE, Anecdotes)**, born about 1574, was son of John Tresham; succeeded his grandfather sir Thomas, the first and last prior 30 Nov. 1557 of the re-erected order of St. John of Jerusalem, who died March 1 or 8, 1599, whose tomb with effigy is now in the church of All Saints, at Rushton; it is shown in **HARTSHORNE**, *Reverent Monumental Effigies in North.*, fol., 1867 or 1876. Sir Thomas "the builder" was knighted in the autumn of 1575 at Kenilworth, by queen Elizabeth. "Being zealous in the Romish persuasion" his first commitment was 10 August 1580, which suggests a reason for the sudden termination of the work at Rothwell, which he may not have revisited until 1593, when he probably enlarged the mansion and erected the triangular Rushton Lodge; and was again imprisoned at end of 1596. In or after 1600 he was released, and became occupied with the New Building at Lyveden, but dying 11 Sept. 1605 before its completion nothing more was done to it. It is not known where he was buried.

Rothwell market house was begun 1577: in May 1887 it was proposed to restore and complete it. (*Illustrations*, s. v. Market House, 1867, pt. 1). Rushton Lodge has on it the dates of 1580, 1593, 1595, 1626*, and 1641*; it is in the park of Rushton hall, near Kettering; it was afterwards the seat of capt. Clarke Thornhill, now the property of lord Lyveden. The two late dates (if so) marked * require to be accounted for. **BUILDER JOURNAL**, 1845, iii, 538-9; **BUILDING NEWS JOURNAL**, 1867, xiv, 510; **BRITISH ARCHITECT JOURNAL**, 8 January 1886, gives Rushton Hall; (also **NEALE**, *Seats*, 4to., 1826, iii, 2nd Ser.). Lyveden new building, near Thrapston, which may have been begun 1601 or soon after, is designed on a + plan. In the volume of drawings by John Thorpe in sir John Soane's museum, are three plans (fol. 215-6) and an "upright" is referred to, of Lyveden, and on them are shown alterations or amendments. As Thorpe was living till after 1612 (perhaps till 1620), Mr. Gotch considers that as he had been much engaged in Northamptonshire, he would have been known to Tresham, and therefore designed for him both the Δ lodge and the + house to meet his client's views: he also states that both of these buildings have "details in many respects singularly like some of those at Kirby" of which he (Thorpe) laid the first stone in 1570. **BUILDING NEWS JOURNAL**, 1881, xl, 124. The rich screen dated 1618 (cut up and placed in the vestry), in Geddington church, has been ascribed to sir Thomas, but was the gift of Maurice Tresham of Newton.

BRIDGES, *North*, fol., Oxford, 1791. **BAKER**, *Northamptonshire*, fol., 1822-41. **T. BELL**, *Ruins of Lyveden, with Notices of the T. Family*, 8vo., 1847 (not reliable). **HARTSHORNE**, *Hist. Memorials of North.*, 8vo., North., 1848. **WHELLAN**, *Hist. Gaz.*, etc., 1849. **ARCHITECTURAL SOCIETY OF NORTHAMPTON**, *Papers*, 8vo., 1850-55. **ONCE A WEEK JOURNAL**, 1862, vi, 55. **QUARTERLY REVIEW** for 1857 (incorrect). **RUSHTON PAPERS**, *A Calendar of Papers of T. Family*, 1580-1605, 8vo., North., 1871. **SWEETING**, *Descr. of the Lodge, with Notes of the Church and T. Family*,

North, 1881. GOTCH, *Complete Account of the Buildings erected by Sir T. Tresham*, fol., North, 1883: and *A Building Squire of Elizabeth's Time*, in *BUILDER Journal*, 1889, lvi, 295, 300.

TRESSEL; see TRESTLE; and HORSE.

TRESSINO (ADAM JOSEPH), colonel of engineers, of Lugano, entered the service of Peter the great; designed 1703-34 the fortress at S. Petersburg, which was completed 1740 by colonel Munich. SVININ, *Objets les plus remarquables*, 4to., S. Peters, 1816-18, iii, 9. STAHLIN, *Anecdotes*, 8vo., London, 1788, p. 197. He designed from 1714 the cathedral of SS. Peter and Paul in the fortress. It is presumed he died in 1733 or 1734. 68.

TRESTANT (SÉBASTIEN), master mason 1460 at Laon, was called about 1460 to direct the works of the transept at S. Quentin (dept. Aisne), in France; which were completed 1477-87 with the portail du Midi, by Colard-Noël. LANCE, *Dict. Biog.*

TRESTLE, TRESSEL, and TRUSSEL (Fr. *baudet*; *chevalet*). The several sorts used in construction and for repairs are described s. v. HORSE. A patent "ridge trestle" for supporting persons and planking, is described in *BUILDER Journal*, 1860, xviii, 356. 5.

"1311, Trestelli, trestella, 1354, 1397, tristelli; three-footed movable supporters of the lever or planks of wood which constituted a movable table or bench; "iiij pair of trystels, 8s."; probably from the Gr. *τρος* and *σκελος*; SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 452. Trestles of 1451 and later, at Cambridge, are noticed s. v. Table.

TRESTLE BRIDGE. An example of this construction at Oneida Creek valley, on the Utica and Syracuse Railroad, U.S.A., of 29 ft. span, is given in HANN AND HOSKING, *Bridges*, 8vo., 1843, i, cxxxix, pl. 66 and others. Over the Little Schuylkill and Susquehanna, about 100 feet high, in ALLGEMEINE BAUZEITUNG, 1845, pl. 646. Those on the Central Pacific Railroad of California, in *ENGINEERING* for 1869; and *BUILDING NEWS Journal*, 1869, xvi, 201, 209. A "trestle wire suspension bridge" is described by Yandell and Johnson, of Mobile, in *CIVIL ENGINEER*, etc., *Journal*, 1855, xviii, 160.

TRÉVES; see TRIER, in Northern Prussia.

TREVICE; see TRAVICE: and TREVISE BOARDING, see TRAVERSE.

TREVIGI or TREVISO (GIROLAMO DA); see PENACCHI (G.).

TREVIGLIO, Trevilio, or Trevio; see ZENALE (B. DA).

TREVIO (BERNARDINO BUTTINONE DA), of Milan, is apparently the same as B. ZENALE, of Treviglio.

TREVIS; see TRAVIS.

TREVISO and TREVIGI (Lat. Tarvisium and Travisium; Fr. Trevis). A town in the province of Trevigi, near Venice, in Italy, strongly fortified 1500-1509 by fra G. Giocondo, and enclosed by a moat fed from the river Sile; and entered by three gates, the porta di SS. Quaranta Martiri 1509-16, and di S. Tommaso, are by Tullio Lombardo; but also attributed to fra Giocondo and il Bergamasco. There are spacious streets, large squares, and handsome houses, many having arcades and planted gardens. Some hydraulic works upon the Piave 1507 were by fra G. Giocondo. It is the see of a bishop. The cathedral dedicated to S. Pietro, of XII cent., is a fine but incomplete Lombard work: it was restored XV cent. by P. Lombardo, to whom is ascribed the cappella del' Annunziata; while T. Lombardo designed cir. 1474 the cappella maggiore and the chapel of the sacrament. The Dominican church of S. Nicolo di Bari, with its monastery, was designed 1306-18 by fra Benvenuto della Cella, continued till 1348 under fra Nicolo da Imola, and to 1400 by Dino. "There is more harmony between the length (274 ft.), width, and height (107 ft.) than is to be found in many others", according to FEDERICI, i, 173-6; 207. The transept, if not the whole of the Madonna della Grazie or Madonna grande, completed 1530 by T. Lombardo with the help of Giulio and Sante; and the tomb therein to Mercurio Bua (died 1529); and three chapels with the organ in S. Polo. There are also the churches of S. Leonardo, S. Andrea, S. Maria Maddalena: and a fine palazzo publico; two handsome theatres, one built before 1780 by G. Miazzi from the designs of A. Galli Bibiena; and one called Onigo (one

of these was burnt 11 Oct. 1868): the palazzo Bressa or Bettignole a S. Stefano, and pal. de' conti Pola, which are both by P. or T. Lombardi. BONIFACIO, *Istoria di Tri.*, Ven., 1744. BURCHIELLATI, *History of the Town*. RIGAMONTI, *Pitture di T.*, *Memorie delle Arti di T.*, 1803. FEDERICI, *Memorie Trevigiane*, 4to., Ven., 1803, p. 171-6. FREEMAN, *Neighbour Lands of Venice*, 8vo., 1881. 14. 28. 50. 96.

TREVISO (GIROLAMO DA); see PENACCHI (G. DA).

TREYYES or Hod; see TRAY.

TREZO or TREZZO (FELIFE), an Italian, a relation of the sculptor Jacome Trezo; began 25 August 1582 the fine church of S. Vicente de Afara, completed 1629; the roof about 1582 of that of S. Roque with fir beams from Prussia, each beam being 96 palms (80 ft.) long, both churches being at Lisbon; also the castle of Nuestra Senora de la Asuncion en la barra de Vila do Conde, 16 miles northwards from Oporto. 66.

TREZZI (AURELIO), of Milan, 1590 designed the Carmelite church of S. Carlo: and 1595 the basilica of S. Stefano in Broglia. *Raccolta dell' intorno, etc.*, Milano, fol., Milan, 1823. Plan given in LECLÈRE, *Recueil*, fol., Paris, 1826, pl. 31. 68.

TRIACHINI (BARTOLOMMEO), flourished 1550. He designed the palazzo già Vizani poi Bentivoglio indi Lambertini, ed oggi Ranuzzi; the palazzo Malvezzi Medici; and the cortile of the palazzo Poggi, later Cellesi, now the university (the façade, etc., by P. Tibaldi). MUZZI, *Annali Bolognesi*, 8vo., Bol., 1844, vii, 356. BOLOGNINI-AMORINI, *Vite dei Pittori, etc.*, 8vo., Bol., 1841-43, v, 398. *Pittori, Scult., ed Archit.*, 12mo., Bol., 1782. 105.

TRIANGLE. A figure having three angles and consequently three sides. There are triangles of various sorts, plane or rectilinear, spherical and curvilinear, equilateral and obtuse. The equilateral triangle is used as a symbol of the Holy Trinity, and many figures in Christian ornamentation are constructed on this principle, as types of that mystery. It is also found in the form of the pointed arch, in the proportions of churches themselves, and next to the cross is the most important form in Christian design. (THREE.) The Egyptian triangle has the side of 30°. PLUTARCH, *Treatise of Isis and Osiris*. *Ann. Fabb. duomo di Milano*, i, 54, 56. BELTRAMI, *Per la Facciata del duomo di Milano*, fol., Milan, 1887; noticed in R. I. B. A., *Journal*, 1887, p. 78-9. VIOLETT-LE-DUC, *Habitations of Man*, 8vo., London, 1876. The Romans used four triangles in setting out the plan of the orchestra of a theatre; the Greeks employing three squares. The subject has been largely treated s. v. PROPORTION. *Principles of the triangle*;—SCOTT, *Gleanings*, 8vo., 1863, p. 27. BARLOW, *Symbolism in reference to Art*, in *ROY. INST. OF BRITISH ARCHITECTS, Sessional Papers*, 1859-60, p. 98-100, 108. BLONDEL, *Cours*, 8vo., Paris, 1771, i, 387. WOODS, *Letters*, 4to., 1828, i, 134. "Miss Hosmer (at Rome) told me that Gibson of Rome had made a discovery by which he could accurately ascertain the proportions of the human figure by subdividing a triangle, so that if any one part of a statue be determined on, according to this measurement all the other parts can be easily ascertained, and the scale has been verified over and over again on the best Greek models"; Lady BLOMFIELD, *Reminiscences*, 8vo., London, 1883, ii, p. 304. Some buildings have been erected on a triangular plan, as the lodge at Rushton (TRESHAM); Croyland bridge; and others. 25.

In measuring, all irregular figures must be reduced to triangles. In carpentry, all frames of more than three sides must be reduced to triangles to prevent a revolution round the angle s.

TRIANGULAR COMPASSES (Fr. *compas à trois jambes*). Such as have three legs or feet and two pivots by which any triangle, or any three points, can be taken off at once. It is useful only in rough work, as the instrument is difficult to handle.

TRIANGULATION. A name given to the network of triangles with which the face of a country is covered in a trigonometrical survey from one base line. CASTLE, *Surveying, etc.*, 8vo., 1847, 2nd edit., 118.

TRIAPSIDAL. Three apses at one end of choir. WHEWELL *German Churches*, and WEBB, *Continental Ecclesiology*, 1848,

have used the word "triapsal" in error; as noted in *ECCLESIOLOGIST Journal*, 1849, ix, 232.

TRIBIGLIA, Tribilia, and Trebilia; see TERRIBILIA (F.).

TRIBOLO; II; see BRACCINI (NICOLÒ); also called NICOLÒ of Florence.

TRIBONS. The desks or seats of the officiating priests, 1411; SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, clvi, 452.

TRIBUNE. The apsidal part of a basilica. A bench or elevated place from which speeches were delivered. The BEMA of the ancient Christians. APSE. AMBO. The apsis gradata, also and earlier called EXEDRA (Fr. *tribune*; Arab. *alcassir*). The tribune of the Romans was a raised platform, generally movable. ROSTRUM. Near the temple of Isis at Pompeii is a building consisting of a court, having a portico of the Doric order on three sides, with two rooms at one end supposed to be a crypt, and an elevated pulpitum for a speaker at the side: an inscription has "cryptum tribunal theatrum S. P." At the ancient Thamugas in North Africa, in front of the *curia*, is a platform surrounded by a wall; undoubtedly the tribune where the magistrates sat on the *sella curulis* when transacting public business; GRAHAM, in R. I. B. A., *Transactions*, 1885, p. 148. 25.

The semicircular recess or tribune behind the choir, as at S. Clemente, at Rome; Fano; Ravenna; S. Zeno at Verona; Siena, S. Miniato near Florence, and other places. The three apses at Sta. Maria del Fiore give the cruciform plan to the church. The tribune of bishop Pelagius II (577-590), raised above the floor of the nave in the basilica of S. Lorenzo, at Rome, has ten fluted columns of pavonazzetto, half buried. The tribune at S. Peter's at Rome, said to be decorated from designs by Buonarrotti, contains the bronze chair, by Bernini 1667, which encloses the chair in which traditionally S. Peter and others sat.

Tribune in the refectory; as at S. Martin des Champs, XIII or XIV cent.; see PULPIT.

The saloon holding the celebrated statues, in the galleria degli Uffizi, at Florence, begun 1574-87, finished 1610, for a cabinet of curiosities, is called a tribune, perhaps on account of the domed ceiling with an aperture, now closed. The temple to Galileo erected 1840, in the palazzo Pitti, at Florence, is so termed perhaps for the same reason. 28. 96.

"La tribuna che andava sopra i quattro archi", writes SERLIO, *Architettura*, fol., Ven., 1663, p. 117, on the dome designed by Bramante for S. Peter's church: but in writing of Peruzzi's design (p. 118), "tribuna" appears to relate to the drum (also p. 386). In the quotations given s. v. Lapi, the word *tribuna* means the great cupola of Sta. Maria del Fiore.

The tribune of château de Tremouville, is given in NODIER ET TAYLOR, *Voyages Pitt.* (Bretagne), fol., Paris, 1845-6, ii. Others are named at Les Andelys; the palais ducal at Nancy; a house at Nuremberg; the hôtel de ville at Ratisbon; this latter is a PORCH, the others may be pulpits. A tribune or seat "au rez-de-chaussée", in the church of the Filles de l'Assomption, rue S. Honoré, at Paris, by C. Errard, 1670-76; BLONDEL, *Arch. Franç.*, fol., Paris, 1754, iii, 140.

Many of the churches in Spain have in front of the apse a "tribune ou salle haute". The tribune of the Moors in the mosque at Cordoba.

DE CAUMONT applies "tribune" (TRIFORIUM) to the lower of the two galleries between the arches and the clearstory, of the choir at Montiérender, in Champagne; *Rapport sur une Excursion Archéologique*, 8vo., Paris, 1851, p. 80-1.

TRICCA. An ancient city of Thessaly, situated on the river Peneius; it possessed a temple of Esculapius, which was regarded as the most ancient and illustrious of all the temples of this god. Trikkala is now one of the largest towns in this part of Greece. 23.

TRICHORUS, Trichoron. The Greek term for a dining-room, so called from its being divided into three parts by two rows of columns, and because it contained three ranges of tables for three classes of guests—princes, officers of the palace, and

guests; ORDERICUS VITALIS, ii, 412. SALMASIUS, in SPARTIAN., *Hist. Aug.*, 8vo., Lug. Bat., 1671, p. 676. DU CANGE; s. v.

TRICLINIUM. The Latin term for the dining-room of the Romans, and so called because in general it contained three couches round the table, the guests reclined upon them at their meals; each couch generally held three persons; access for the servants to the table in the middle being obtained by the fourth side being left open; sometimes the couch was of the same shape. SIGMA. The ÆCUS was often adapted for a triclinium. LUCULLUS had one formed in his Tusculan villa inside an ORNITHON or aviary. "The length of a triclinium is to be double its breadth, and the height is to be one-half of the length and breadth together." Winter triclinia are to face the west for the afternoon light and for the rays of the setting sun; spring and autumn triclinia should be towards the east; and summer triclinia towards the north. Round the porticoes are placed the triclinia for common use; these and others are described for special use, in VITRUVIUS, B. 6, ch. v and x. LIBRARY OF ENTERTAINING KNOWLEDGE, *Pompeii*, 8vo., 1832, ii, 12-6; 88; etc. Pope Leo III (795-816) built the "triclinium leonianum", or refectory in the Lateran palace, at Rome, and had a mosaic picture; LETAROUILLY, *Rome Moderne*, fol., Paris, 1825-60, pl. 225, text 4to., 1840-50, p. 473, 494. CIACCONIUS, *de Triclinio Romano*, 12mo., Rome, 1588. NICOLAUS ALLEMANUS, *De Parietinis Lat. restitutis*, 4to., Rome, 1625, pl. 36-40. RASPONT, *De Basil. et Pal. Lat.*, fol., Rome, 1656. 1. 25. 78. 96.

TRIDENT (Lat. *fuscina*; *tridens*). An instrument in the form of a fork with three prongs, often seen in sculpture as the sceptre, weapon, or attribute of the god Neptune or Poseidon, of Nereus, and the Tritons, and therefore is often sculptured on the face of modern edifices belonging to the navy. The Retiarius in the combats of the gladiators was armed with a trident. A Moorish trident, in use by them in the XII and XIII centuries in Spain, is shown, from a little known example, in JUBINAL, *Armeria reale de Madrid*, fol., Paris, 1838, pl. 39. 78.

TRIDENTUM. See TRENTO, in Austrian Tyrol.

TRIENT. The German name for the Italian TRENTO.

TRIER (Anc. Augusta Trevirorum; Eng. Treves; Fr. Trêves; Sp. Tréveris). The capital of the government of the same name, in Rhenish Prussia, situated on the river Moselle, over which is a Roman stone bridge of 8 arches, dating about 28 B.C., probably by Agrippa, 690 ft. long and 24 ft. wide, with piers 66 ft. high and 21 ft. wide; it was blown up 1689, the arches restored 1717-20. The town is surrounded by walls having 5, 8, or 11 gates. The other remains of the Roman period are the palace said to have been the residence of several of its emperors from Constantius to Theodosius, and to have been restored by Constantine 306-31: EUMENIUS mentions a circus, basilica, and forum as royal works. This edifice is now considered to have been a basilica (STEININGER's researches). It is 227 or 180 ft. long, 88 ft. wide, and 97 ft. high, with walls 10 ft. 3 ins. thick, built of flat tiles and strong mortar and pierced with two ranges of windows; the plan is given s. v. Basilica (p. 35) and there stated to be 239 ft. 6 ins. by 98 ft. 6 ins. and 104 ft. to roof; the marble pavement rests on a hypocaust: part of it, the heidenthurm is a semicircular tower in which is an arch 60 ft. span. In front are *thermæ* or imperial palace, erected in 1 cent. A.D. and destroyed in v cent.; one frontage is about 565 ft. (COMPANION TO THE ALMANACK, 1885, p. 157), it was excavated in 1818. To the east and outside the town is the amphitheatre, scooped out of the hill, by which the arena is preserved (KURIPUS), and two vaulted passages; it is 234 or 219 ft. 6 ins. long and 155 ft. wide, and may have held 30,000 or 53,000 persons; it was cleared out in 1816. The fine double gateway called porta Nigra and porta Martis, or schwarzesthor, about 314-22, but called by KUGLER a Merovingian structure; it is about 115 ft. long, 30 ft. deep, 70 to 95 ft. high; it was restored and opened 23 July 1817. LINDE, *Die Porta Nigra*, 1853: BUILDER *Journal*, 1845, v, 13; and house near, 46. The aqueduct from the river Rurw partly exists underground, where it is 3 to 4 ft. wide and 6 ft. high. SCHMIDT,

Baudenkmale, fol., Trèves, 1845, or *Arch. Ornts. of Roman Period in and near Trèves*. It is surmised that these monuments were set out not by "the old Roman foot equivalent to from 130 to 132 Paris lines, but by another foot. Should this foot, which was lost at some distant period, be the measure of the ancient Greek, which according to EYTELWEIN, *Measures and Weights*, 1810, contained from 136 to 142 lines, it becomes equivalent to the Rhenish standard measure (of 1816) of 139.13 Paris lines; and these buildings, belonging to the age of Constantine, may probably have been built by Greek architects"; DE LASSAULX, in *WHEWELL, Arch. Notes*, 8vo., 1842, 3rd edit., p. 154.

The city now consists of the town proper and of nine suburbs; it has few squares, and a number of irregular and narrow streets. HAGHE, *Sketches*, fol., 1840-50, shows the fountain in the market-place. It is the see now of a bishop. The cathedral, dedicated to S. Peter and S. Helena, is an irregular structure with five towers, from the IV cent. early Romanesque down to XII cent., and supposed to have been the basilica of the palace built for the empress Helena. The cloisters 1250, restored 1847, and chapter-house, are remarkable. The "Devil's pillar" before the cathedral is from the well-known quarry in the Odenwald. LA BORDE, *Monuments de France*, fol., Paris, 1816, pl. 132. SCHMIDT, *Dom. zu Trier*, 1839. WILMOWSKY, *Dom. zu Trier seinen drei Haupt-pewden*, 26 pl. HEIDER, EITELBERGER and HEISER, *Mittelalterliche Kunstdenkmale des Oesterreichischen Kaiserstaates*, fol., Stutt., 1856-60. GAILHABAUD, *Monuments*, 4to., Paris, 1850, ii, 9 pl. KING, *Study Book*, 4to., fol., London, 1858-68, iv, 3 pl. ROISIN, *Cath. de T. du IV au XIX siècle*, 4to., 1861. The Liebfrauenkirche, 1227-43 as inscription (one of the earliest specimens of pure Pointed work in Germany, and its sculptures good specimens of the TRANSITIONAL STYLE), is in the form of a Greek cross surrounded by apsidal chapels, and is nearly a circle on plan; the choir is nearly a square with an apse (somewhat repeated at Kaschau cathedral); it was restored 1871. KING, iv, 2 pl.; GAILHABAUD, *Mons.*, iii, 3 pl., and two tombs, ii, 2 pl. S. Simeon was formed in XI cent. in the porta Nigra and consecrated by archb. Poppo. The Roman palace (first repaired for the Lutheran worship 1840-47) was restored by Schnitzler and by König, builder, as a Protestant church; *BUILDER Journal*, 1857, xv, 252. S. Maximin monastery is now a barrack; S. Martin's a manufactory. S. Mary of the Four Martyrs is on the site of the residence of the Roman prefect. S. Antony, late Pointed; has a churchyard cross and a lychgate on the north side. S. Gangolphus has some interesting details. The Jesuitenkirche, large late Pointed, has a clerestoried triforium to the chancel, and a stone west gallery having Flamboyant tracery. S. Paulinus outside the gate, 1756 (Italian), much decorated. S. Matthias, a short distance away, an immense building, the monastery destroyed; Romanesque parts, vaulting middle Pointed, and later additions; a west elaborate Romanesque tower, and two at east end, all with Renaissance parapets. It is now a school, and the lady chapel a residence. There is a synagogue.

The extensive palace of the electors and bishops dating 1614 is now barracks; it contains the basilica of the Roman palace: the town library of 100,000 vols. from various religious houses; and museum of Roman remains; the very large S. Paul's hospital; the rotheshaus or red house formerly town hall, now an hotel; theatre; the university founded in 1454, enlarged 1722, is over the gymnasium, with a library of 70,000 vols. A specialty of the town is the preparation of stones for Gothic churches, which are sent off ready to be at once placed in position.

MERIAN, *Topographia*, fol., Franc., 1646, vi. BROWER, *Antiq. of Treves*, fol., Leod., 1626; 1670. HETZRODT, *Les Anciens Trévirois, suivis de recherches sur les chemins Romains*, etc., 8vo., 1809. LA BORDE, *Monuments de France*, fol., Paris, 1816, i, pl. 91-2, gives the palais pretorial, 93 the palace of the emperors, 94 thermæ, and 95 fragments. SCHMIDT, *Trier*, 4to. and fol., Trèves, 1836-9. DAWSON TURNER, *Roman Antiq. of Treves*, 8vo., 1839, being translation of WYTTENBACH, *Geschichte von Trier*, ARCH. PUB. SOC.

8vo., 1810. WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 69-73. C. R. SMITH, *Notes on the Antiq. of Treves*, etc., 8vo., 1851. SOPWITH, *Three Weeks in Central Europe*, 8vo., 1869. HUBSCH, *Alt Christlichen Baukunst*, fol., Carls., 1858-64. FREEMAN, *Historical Sketches*, 8vo., 1876; *Historical Essays*, 3rd series, 8vo., 1879, p. 68; and his *Augusta Treverorum*, in *BRITISH QUARTERLY REVIEW*, July 1875. PALUSTRE ET BARBIER DE MONTAULT, *Le Trésor de Trèves*, 30 pl., 4to., Paris, 1886. ENCYC. BRITANNICA, 4to., Edinb., 1888. 14. 15. 23. 28. 50. 78. 96.

IGEL, about six miles distant, is remarkable for the structure 72 ft. high and 20 ft. square at the base, a richly ornamented Roman work, date unknown; it is presumed to be the tomb of the family of Secundinus: it stands on the side of the *via* leading to Reims; *BUILDER Journal*, 1847, v, 482; PROUT, *Sketches in Flanders*, etc., fol. (1833). HAWICH, *Monument*, 1826. KUGLER, *Handbuch*. LA BORDE, *Monuments de France*, fol., Paris, 1816, i, pl. 96-99. WYTTENBACH, *Antiq. Rom. dans la vallée de la Moselle, de Trèves*, 12mo., 1848. The königs-thiel near the city (and Rhense), was restored before 1843 by J. C. von Lassaule.

TRIESTE (Anc. Tergeste; Engl., Fr., and Gr. *Triest*). A seaport of Illyria, situated on the gulf of Trieste, at the north-eastern angle of the Adriatic. The Roman works comprise seven columns with entablature on the tower of the cathedral; and a half-buried archway, perhaps part of an aqueduct, which is like that at Fiume. The *allstadt* has narrow streets, but the modern portions including that near the harbour from about 1719 are well laid out and built, with piazzas and a canal formed 1752 running inland to many warehouses. A map of the *rhede*, roadstead, shore, and harbours with the *molo Klutsch*, are given in ALLGEMEINE BAUZEITUNG, 1842, pl. 446-9. The mole 1744-69, is 2,200 ft. long and 60 ft. wide, a lighthouse, casemated at base, is by Pertsch (A. B., 1838, pl. 217): some of the buildings of Austrian Lloyd's are by Pertsch (A. B., 1839, pl. 322); the arsenal by C. Hansen (A. B., 1857, pl. 129-34), who leaving the town in 1857 the works were continued by Herder; and by J. Kranner (died 1871). The *hafenbau* or port railway works are by F. Boemches (A. B., 1872, pl. 1-4; 1874, pl. 36-41; 1876, pl. 23-32; 58-64; and 84-9). There are several fountains, one 1752 has a bronze statue to the emperor Leopold I; the monument to the emperor Maximilian of Mexico by Schilling of Dresden, placed 1 April 1875: his château of Miramar is near the town. The town is the see of the bishop of Capo d'Istria.

The *dom* or cathedral, dedicated to S. Giusto, dates from V century; in its walls are Roman fragments. The plan is peculiar; it is supposed by KANDLER, *Arch. Triestino*, 1829, i, 131, that two churches nearly adjoining at the sides were incorporated, and thus a nave, *cir.* 1262, of great width was obtained. The present plan of S. Giusto and the basilica del Santissimo, is shown in JACKSON, iii, 354; while DALY, *Revue Générale*, 1852, x, 20, gives the old plans of the basilica and of the chapels of "S. Juste and Servulus" with a baptistery on the north side. The mosaics were restored 1878 under V. de Senibus, architect. A stumpy campanile on Roman work dates 1337. HUBSCH, *Alt Christlichen Baukunst*, fol., 1858, etc. There are nine or more churches of various religions; among them S. Peter, 1602, the ancient cathedral; Sta. Maria Maggiore; the Jesuit church, with a fine colonnade of the Corinthian order; S. Antonio nuovo, 1830, by P. von Nobile; a Protestant church and cemetery (opened 1837); a synagogue; and two Greek churches. *Il Sepolcro di Winckelmann*, murdered 1768, 4to., Ven., 1823, is in the cathedral yard.

Among the public edifices, are the governor's residence, the new municipal buildings; fine hall of the provincial diet; handsome old exchange; the palazzo Revoltella (banker) now the museum; the grande or huge Politeama; the filodrammatico, and maoroner theatres, the last in the form of an amphitheatre; the Karls, or old lazaretto of S. Carlo, by Balsano, A. B., 1842, text p. 300; new *lüftungs magazin* im Theresien lazareth, A. B., 1842, pl. 461; the new lazaretto, one of the largest and best arranged in Europe, has a separate harbour in which sixty vessels can perform quarantine at once, lodgings for 200 persons, and is

surrounded by a wall 24 ft. high; (the one in HOWARD, *Lazzarettos in Europe*, 4to., Warr., 1789; 1791, has been removed): the houses (in 1846) of Carciotti, Girot, and Chiozza, are the best; the immense hotel on the quay, shown in ILLUSTRATED LONDON NEWS, Jan. 1846, viii, 5; the new civil hospital for 2,000 persons; Eisenbahnhof or swimming-baths, A. B., 1859, pl. 283-9; and the *Tergestoom*, designed 1842, by Mollari, which comprises a bazaar, concert and ball-room, merchants' hall now exchange having a colonnade of the Doric order and a spacious portal, the offices of Austrian Lloyd's, with the casino Tedesco and reading-room over on the upper floor. The Sistiana quarries near, supplied the stone for the harbour, about 1873. I. DELLA CROCE, *Historia Antica e Moderna, etc.*, di T., fol., Ven., 1698. CAVALLI, *Storia di Trieste*. CASSAS, *Voyage Pitt. de l'Istrie, etc.*, fol., Paris, 1802, p. 73. NEALE, *Notes on Dalmatia, etc.*, 8vo., 1861; and in ECCLESIOLOGIST JOURNAL, 1861, xxii, 289-96. FREEMAN, *Neighbour Lands of Venice*, 8vo., 1881. JACKSON, *Dalmatia, etc.*, 8vo., 1887, iii, 343.

WILMOWSKY, *Die Römische villa zu Nennig, und ihr Mosaik*, near Trieste, 9 pl., fol., Bonn, 1865. The lighthouse at Salvore, near the entrance to the gulf, 1833, is by P. von Nobile; it is 106 Vienna ft. high from half tide to the centre of the light; A. B., 1836, pl. 9. 14. 26. 28. 50. 96.

TRIFORIATUM OPUS. A sort of pierced work in metal, or other material, sometimes but not always used as a border; trifloric or lace work was a word applied to tracery *cir.* XVII cent. 16.

TRIFORIUM, also called BLIND-STORY and NUNNERY (Fr. *travée*). A term of uncertain origin. GERVASE in his account of Canterbury cathedral either invented it or received it from the workmen: DUCANGE has *tres-fores*, but GERVASE's openings were two or four. SUMNER suggested the Latinization of "thoroughfare", as *thoroughfurium* of WILLIS, at ROY. INST. OF BRIT. ARCHITECTS, 1848; B. J., vi, 328. The Italian "traforare", to pierce through, has been suggested. PARKER in 1852 stated that the usual derivation of *tres* and *fores* did not hold good, and was of opinion that it was a contraction of *turnin-forium* or tower passage, and should be applied to the *clearstory* passage, and not to the lower one now generally so called, but is properly "blind-story". This upper gallery always led into the tower, and in Christ church, Canterbury, there is no other approach; BUILDER JOURNAL, 1852, x, 205; and 1857, xv, 745. NOTES AND QUERIES JOURNAL, 1857, 2nd Ser., iv, 269, 320, 371. BERTY, *Dict. d'Arch. au Moyen Age*, 8vo., Paris, 1845, p. 303. DE CAUMONT uses TRIBUNE for the lower passage. There is no triforium at Toul ex-cathedral; at Alcobaca monastic church, 1148-1222; and Freiburg am Brigau.

In the basilicas, the manifest triforium was an upper gallery, high and lofty, and so arranged that men with business to transact might have freedom to walk and talk without interruption; in front was a high parapet. The first ecclesiastical triforium was that of Sta. Sophia at Constantinople. Privacy was here preserved as it was intended for women. In Ravenna churches, it was still a practicable gallery, and especially where flat roofs were used. The peculiarities and alterations affecting this feature, in the east, in Italy, the basilican churches at Rome, Romanesque and Lombard buildings, with curious triforia, may be seen. On the banks of the Rhine no ancient triforia were to be found, nor in the Romanesque churches of Germany. An awkward way of getting rid of it is shown at York; and curious changes at Ely; in some cases it became a practicable gallery lighted from without. After the period when processions to chapels in the different stories, including the triforium, ceased, it had failed in use, and died out, and it is perhaps impossible to form a continued history of the triforium and its changes in the western churches; WILLIS, *The Triforium*, in BUILDER JOURNAL, 1848, vi, 328. In England, a gradual change took place from these great galleries, as at Norwich and Westminster, of the XII and XIII centuries, to the narrow passages of the Perpendicular period: the two arrangements are utterly unlike.

In the early French churches, a great gallery runs over the whole of the side aisles, as at Caen; it was useful in accommodating persons to see the ceremonies; then ensued a gallery representing the depth of the timber roof over the side aisle, and was continued with little variation throughout the middle ages. The earlier form is retained at Noyon, and at Paris, and in most churches of XII cent., but in the first years of the XIII cent. it gave place to the second and was not afterwards revived. Its proportions were generally that of one-third of half the height of the nave. The triforium became glazed also, by adapting a flat roof, or one nearly so, as in S. Ouen at Rouen. At Issoire and other churches in Auvergne, the gallery over the aisles looked into the church, and was lighted from the outside, being formed in the hollow space under the continuation of the flying buttresses; FERGUSON, *History*, 8vo., 1865, i, 443, 519.

The term is applied to the open gallery which usually appears over the arches of a nave of a large church, is over the side aisle, and under its roof. It is sometimes the whole width of the aisle, as at Senlis cathedral; Westminster abbey; Chichester cathedral; and in north transept at Hereford. It is occasionally lighted by windows in the external wall. At Easby abbey, Yorkshire, a staircase led up to the library which was over the chapter-house, and so through to the scriptorium or writing-chamber over the parlour, and on to the triforium which was above the east aisle of the south transept. Doubtless the monks, as at Durham, used the triforium for artistic purposes, such as glass-painting, for there are evidences of a chimney in the north-east corner of the transept: ASSOCIATED SOCIETIES, *Reports and Papers*, 1852-53, ii, 332. The arches were *grated* for the use of nuns in S. Pietro at Pistoia; and they were *glazed* at Leon in Spain, and partly so at Lichfield where the aisle roof pitches against the tracery: it is a fascinating feature in the later styles of French architecture, and requires coloured glass for due effect. In the White chapel in the Tower, the triforium was plainly used for worship by the royal family, communicating as it did with their living-apartments on that story; ECCLESIOLOGIST JOURNAL, 1858, xix, 71. SCOTT, *Lectures*, 8vo., 1879, ii, 152. In the triforium of the choir of S. George's chapel, Windsor, is the royal seat of the time of Henry VIII (*cir.* 1520); and in the church of S. Bartholomew, Smithfield, is the oriel window probably the seat of prior Bolton.

In Germany, the triforium does not appear in the Romanesque churches; in the early German churches it is a large open gallery over the aisle, *emporen*, also called *männerchor*, and is continued in the transepts affording a passage all round the building; but at Cologne the triforium is more like a prolonged compartment of the clearstory than, as in England, a constructive portion of the design. WHEWELL, *German Churches*, 8vo., 1842, p. 37; 106-9; 169; 171. At Laon cathedral and at Limburg in Belgium the triforium is double, so characteristic of the early churches of the isle de France. At Bayeux a trefoil-headed arcade occurs in place of the arches. The nave of Orvieto cathedral presents one of the few examples in central Italy of a triforium.

In general, the form of the arches in front, and their filling in, differ in most buildings, even of the same period, as may be perceived by a comparison of the internal elevations of these mediæval structures. WEBB, *Continental Ecclesiology*, 8vo., 1848, index. FREEMAN, *Historical Sketches*, 8vo., 1876. *Illustrations*, s. v. Triforium from Notre Dame at Paris, 1863-65, pt. 1, pl. 247 or 152; and s. v. Lantern from Coutances cathedral, 1861, pt. ii, pl. 180 or 116. 1. 14. 16. 19.

TRIFORIUM TABLET. The running tablet or cornice below the triforium; a term used by WHEWELL, *German Churches*, 8vo., 1842, p. 103.

TRIGLYPH (It. and Sp. *triglypho*; Fr. *triglyphe*; Ger. *drey-schiltz*). In Greek architecture, the *zophorus* or frieze in the entablature of the Doric order is ornamented with triglyphs repeated at equal intervals, and having a space called *metope* between each of them. These spaces were originally open.

TRIFORIUM



CATHEDRAL, PARIS.

Lithographed for the Society by Vincent Brooks, Dec^r 1865



The triglyphs represent the ends of the joists resting upon the tiebeam. It was the ancient custom to have these joists of such a length as to project considerably beyond the external face of the wall, as in Etruscan work. In later times, the ends of the joists were cut off at the beams. It is supposed that the *glyphs* or grooves at the ends are traditional, and that such notches were so cut to allow the water to run off; the drops hanging below being represented by the guttæ. In a tomb at Norchia, there are no outside chamfers. Other writers consider that the triglyph was originally a mere ornament to conceal the ends of the joists in wooden buildings and for decoration, they were covered with blue wax. In some examples, the triglyphs are not carved on the block of the frieze but on a separate slab of stone fastened on. The face of it was at first made upright and then sloping. At Cadachio there are no triglyphs. The Greeks always placed a triglyph at the angle of the frieze, probably for the purpose of presenting the subjects carved on the metopæ in an uninterrupted series. DALY, *Revue Générale*, 1857, xv, 13, 186, 231-6. In the hollow crown moulding at the temple of Denderah (TENTRAH) in Egypt, is a decoration very similar to the triglyph, which is also placed at the angle.

To obviate the difficulty of the end metope being thrown out of proportion, the end triglyphs were slightly enlarged, or the intercolumniation at the angle narrowed (OPTICAL CORRECTIONS). Each triglyph consists of two entire *glyphs* or channels and of a half one at each angle, separated from each other by a plain face (called MEROS or FEMUR and SHANK) as well as from the half channels. These glyphs are cut to an angle in depth, or are curved; the top is finished to a mitre angle, or otherwise shaped at the head; DONALDSON, *Basses*, in STUART, *Athens*, Supp. vol., fol., 1830, p. 12, gives several examples proving the variety in this minute point of the Doric order. At Delos, bulls' heads took the place of the triglyph: and at Aizani, bulls' heads and skulls with festoons. A splendid block of two triglyphs, $6\frac{1}{2}$ ft. long by 2 ft. 10 ins. high, with a metope of Phœbus and four horses of the sun, *cir.* 306 B.C.; was found by Schliemann at Troy, and given in his *Troy*, etc., 8vo., 1875; BUILDING NEWS *Journal*, 1878, xxxiv, 264. The *guttæ* under the triglyph were either rectangular or conical; or as is universally the case in Sicily, cylindrical. They were always six in number. In the Greek and in some Roman examples the triglyph is surmounted by a MUTULE. The diversity of the triglyph is very great, in all its details, as may be seen in MAUCH, *Darstellung der Architect. Ordnungen*, 4to., Potsdam, 1845; the volumes of STUART, *Athens*; and of the SOCIETY OF DILETTANTI NORMAND, *Parallèle*, fol., 1819; 1825; and others.

The triglyph in the Doric order of Roman and Italian architecture is spaced over the centre of each column in accordance with the intercolumniation, so that a half metope is usually obtained at the angle. DIGLYPH. GLYPH. GUTTÆ. LACUNARIUM. MEROS and SHANK. METOPA. MONOGLYPH. MUTULE. 1. 25.

TRIGON. Another name for the TRIANGLE.

TRIGONUM. The Latin term for a triangular TESSERA used in making a mosaic pavement. Also a musical instrument of the harp sort formed of a triangular figure, seen in paintings in Egypt.

TRILITHON. A dolmen composed, as the name imports, of only three stones. It is of very rare occurrence. An inner ellipse at Stonehenge had five trilithons, from 16 to 21 ft. high, the highest on the south, two on the east still standing, and part of one on the west side and one of the great south trilithons; one which had long deviated from the upright, fell 3 Jan. 1797; no record of the fall of the others (ANNUAL REGISTER, Chronicle); the top stone weighed about 20 tons. There is one at S. Nazaire (Loire Inférieure); the "pierre frite", near Maintenon (Eure et Loire); at Ste. Radegonde in La Rouergue; and the "pierre levade" to the north of Pujols (Gironde). "The only trilithons I know of elsewhere are three in a monument in the Deer park at Sligo; they are small and simulate portals"; and notices instances at Khassia in India; FERGUSSON, *Rude Stone Mon.*,

8vo., 1872, p. 108, 464: since then, the country has been explored east of the Jordan, and hundreds of trilithons have been found, many of which had, to all appearances, been altars; CONDER, *Heth and Moab*, 8vo.

TRILLAGE. As printed in PLAW, *Ferme Ornée*, 4to., London, 1795, p. 8. See TRELLIS.

TRIM; TO. When workmen fit a piece into other work, they say "trim in a piece"; MOXON, *Mechanick Exercises* (Carpentry), 4to., 1694, p. 168. 1. 2.

TRIMEN. A piece of timber framed at right angles with the joists against the wall, for chimneys and well-holes for stairs. 2.

TRIM IN. A piece of work to be fitted between two others previously existing. 1. 2.

TRIMMED, or BRIDLED; as in LOUDON, *Encyc.*

TRIMMER; also called BRIDLE in Scotland; and "bridlings", as in LOUDON, *Encyc. of Cottage, etc., Architecture*, 8vo., 1833, § 1066 (Lat. *interpensiva*; Fr. *enchevêtre*; *chevêtre*). A piece of timber in a roof, floor, or partition, inserted to support the ends of any of the joists, rafters, or other timber. A small beam receiving the ends of several joists and to which they are adjusted or trimmed. BRICK TRIMMER. FIREPLACE. 1. 2. 5. 19.

1532, "ij trymer pees made and sett up under the ij wyndowes in the chambre in the kyng's garden"; BAYLEY, *History of the Tower*, fol., 1824-5, pt. i, app. xxii. 1538, "ye chapel to be seeled wth ye tremors vj foote on heyghte"—"The hall to be seelyd at ye dayse xv foot of heyghte wth a tremor ij foote brode"; GAGE, *Hengrave*, plasterers' contract, 4to., 1822, p. 42. "All joysts on the back of any chimney be laid with a trimmer at six inches distance from the back"; MOXON, *Mechanick Exercises* (Carpentry), 4to., 1679, p. 144.

TRIMMING; in cast work; see FOUNDING (p. 84b).

TRIMMING JOIST (Fr. *solive d'enchevêtre*); and "bridling joist", in LOUDON; "to be one-eighth of an inch thicker than the other joists, for every joist they support." The joist of a floor into which the wood trimmer goes. This joist is made somewhat thicker than the others (like a binder) in order to carry the additional weight. There are several sorts, as a hearth trimmer, placed before a chimney breast; stair trimmer, brought forward at landings to meet the rough strings; and a tail trimmer, to receive the ends of joists. Trimmers are usually rested and notched on timber plates, or on stone when lying on walls, by which they will form ties. When the joist is parallel with the chimney there is but one trimming joist, which comes at the edge of the slab; and then short trimmers are framed on each side of the slab from the joist into the wall. 1.

An iron trimmer or trimming bar (Fr. *bande de trémie*) was formerly used in France to carry the hearthstone, in lieu of the English brick arch.

TRIMMING OF A SLATE. The operation of cutting or paring the side or bottom edges of a slate. The head is never cut.

TRIM OUT. Trimmers of stairs when brought forward to receive the rough strings are said to be trimmed out. 1. 2.

TRIM UP. A partition is trimmed up between a floor and a ceiling; also a post between two beams.

TRINE DIMENSIONS. Three-fold dimensions, as length, breadth, and thickness. 1. 4.

TRINGLE (Fr. *tringle*). A name common to several little square members or ornaments, as regulets, listels, and plat-bands. TINGLE. A small member fixed exactly under every triglyph, under the plat-band of the architrave, from whence hang the guttæ in the Doric order. It is also called a reglet or listel. A French term for a lath or curtain-rod that reaches from one bed-post to another. TRAVERSE. 2. 4. 25.

TRINITARIANS. A religious order instituted about 1197 by pope Innocent III for the ransom of captives among the Moors and Saracens. The rule was the Augustinian, the dress white with a red and blue cross. The mother-house was at Cerffroid, near Meaux. In xviii cent. they had in all 300 houses.

In France they were known as Mathurins from their chapel of S. Mathurin or Mathelin, in Paris. *ENCYC. BRIT.*, 9th edit., 1888. An abbey at Fécamp (MORICE, *Monasticum Gallicanum*, pl. 4; and pl. 54). A fraternity, also so named, of fifteen persons was instituted 1548 at Rome by S. Philip Neri.

TRINITA DE BUENOS AYRES (SANTA); see NEUSTRA SENORA DE BUENOS AYRES.

TRINITY. Theophilus, bishop of Antioch, who flourished in the third cent., was the first who used this term to express the sacred persons in the Godhead. A reversed triangle with representations in the catacombs, is given in ARINGHI, *Roma Subterranea*, fol., Paris, 1658, i, 341-2. EMBLEM. DIDRON, *Iconographie Chrétienne*, 8vo., Paris, 1845. GUENEBAULT, *Dict. Iconographique des Mont.*, 8vo., Paris, 1845, ii, 377. PUGIN, *Glossary*, 4to., 1846, pl. 59. *BUILDING NEWS Journal*, 1889, lvi, 786 et ante. FAIRMOLT, *Dict. of Terms in Art*, 8vo. (1870).

TRINITY COLUMN (Gr. *driefaltigkeits säule*). A commemorative or thanksgiving pillar erected after the cessation of a plague. The following examples are of good design. At Linz, 84 ft. high, erected 1717 or 1723, by S. Stumpfegger, court mason, restored 1777-80 by J. M. Herrstorfer, master mason. At S. Polten, 63 Vien. ft. high, finished 1782. At Ofen, also called "plague" column, 1690-1715; the shaft about 52 Hung. ft. high. At Olmütz, 114 Vien. ft. high. At Wien, 1693, designed by O. Burnacini, built by Fischer von Erlach; 66 Vien. ft. high, and triangular. 26.

TRINQUEAU (PIERRE); see NEPVEU (P.).

TRIPLINTHUS. A wall built three bricks thick, as at Rome, of unbaked bricks. VITRUVIUS, b. 2, ch. 8. DIPLINTHUS.

TRIPOD (Fr. *trépied*). Any article of furniture or article having three feet. The ancient examples whether of stone, marble, or metal were tastefully ornamented and of exquisite workmanship. It was connected with the worship of several gods, and was one of their attributes, especially of Apollo. ALTAR. They are met with in most museums. From Herculaneum, in JENKINS AND HOSKING, *Ornaments*, fol., 1827, pl. 20. COCKBURN AND DONALDSON, *Pompeii Illustrated*, fol., 1827. A bronze one is of peculiar construction, being contrived to open or shut up at pleasure; *Pompeii*, 8vo., 1832, ii, 302. MONTFAUCON, *Antiquité Explicative*, fol., Paris, 1722-4, ii, pt. 1, pl. 52-3. MOSES, *Vases*, etc., 4to., 1814: App., 1828. 6. 25. 78.

TRIPOLI (Anc. CEA, founded by the Phœnicians). A seaport town on the north coast of Africa, the capital of the state of the same name, in the Ottoman empire. A magnificent quadrifrontal arch of marble, of the Corinthian order, erected 164 A.D. to the Roman emperors Aurelius Antoninus and Lucius Verus; it is 41 ft. wide and 33 ft. deep; it is buried up to the impost and is used as a storehouse; PLATFAIR by DONALDSON, *Recent Travels in Algiers*, etc., read at ROY. INST. OF BRITISH ARCHITECTS, *Sessional Papers*, 1876-77, p. 39. LYON, *Travels in Northern Africa*, 4to., 1812, p. 12. At Tripoli vecchia is a Roman amphitheatre still entire 148 ft. diameter with five degrees of seats. In the same direction is the remnant of a Roman *via*, one of many, on the sides of which are ruins of ancient edifices. The castle is a large straggling dilapidated edifice in which the pasha resides; the streets are mere lanes; the houses lighted from a large internal courtyard under which is the reservoir for the rain-water. Six principal mosques and many smaller ones; the great mosque is a good structure, built by the Carumanli family, in which a number of small domes is supported by 16 Doric columns of marble, stated to have once belonged to a Christian church. That of Dragut pacha was erected A.H. 1013 (i.e., 1635 A.D.). There are two or more Christian churches; a Franciscan monastery; three synagogues; and a number of public baths each having a dome; extensive bazaars, and several caravanserais or *fendooks*, a very large one was erected by a Moorish prince in the xviii cent. ALDERSEY, *Voyage to Jerusalem and T. in 1581*, in Hakluyt's collection of voyages, ii, 1809. TULLY, *Ten Years' Residence at Tripoli*, 4to., 1816. LYON, *Travel in Africa*, 1821. IRBY AND MANGLES,

Travels, 8vo., 1823, p. 206. DENHAM, CLAPPERTON, and OUDNEY, *Travels and Discoveries in Northern and Central Africa*, 4to., 1826. BEOCHEY, *Expédition along Northern Coasts of Africa*, 4to., 1828, p. 12. WELLSTED, *City of the Caliph*, 8vo., 1840, i, 398. EWALD, *Reise . . . von Tunis nach Tripolis*, 8vo., Nur., 1842. RAE, *The Country of the Moors*, 1878. PLAYFAIR, *Travels in the Footsteps of Bruce*, 1878, shows the archway. 14. 28. 50.

TRIPTOLEMUS; TEMPLE TO. One is known to have existed near Eleusis; it is now a church to S. Zacharia: sculptures found and model placed in the Beaux Arts, at Paris, *BUILDER Journal*, 1860, xviii, 144. DALY, *Revue Générale*, 4to., 1868, xxvi, 11; 1870, xxviii, 49, with a map of Eleusis. Dr. Phené discovered at this temple two disused columns the flutings of which, though rude and very ancient, gave the number of days of the week and month, forming a lunar calendar; *BUILDER Journal*, xxxvii, 1879, p. 993. The small Ionic temple on the river Ilissus, near Athens, entirely destroyed, is now considered to have been a temple to the nereid PANOPS. STUART, *Athens*.

The fine Poniatowski Triptolemus vase, found in Magna Grecia, and now in the hall of the Etruscan museum in the Vatican, is described in BRAUN, *Ruins, etc., of Rome*, 8vo., Brauns, 1854, p. 482. 28.

TRIQUETRA. An interlaced ornament of frequent occurrence in early northern monuments. It is formed of three half-circles joined at the points.

TRIQUETTI (...), born at Turin, *cir.* 1789, designed the pavillon at Haarlem, for Henri Hope, built by J. B. Dubois. GOETGHEBUER, *Choix des Monumens*, fol., Ghent, 1827.

TRISANTIA, transyta, tresaus, tresante. A vestibule; a narrow or triforial passage, probably like that behind the screen at the lower end of a hall. The "tresantia" was near the chapter-house, and a part of the cloister; perhaps the covered passage between the transept and chapter-house; *ECCLESIOLOGIST Journal*, 1854, xvi, 85, 87, 95. DUCANGE, s. v. *tres* and *trisantia*. KING, *Eastern Cathedrals* (Norwich), 8vo., 1862, p. 135, describes three niches or sedilia in east wall of the cloister close to the prior's door. A recess at Wenlock priory having three lofty arches towards the cloister is perhaps the same. "All who remain for complines, supper being finished, going forth from the chapter-house to the left hand of the entrance, ought to remain in the *trisantia* until all the convent are gone forth"; BERNARD, *Clunian Customs*, ch. 77. SLYPE. 17.

TRISTAN, 1460 made the "dessins et patron" for the portall at Toul; *Bibl. Lorraine*, col. 357; LANCE, *Biog. Franç.* 1872.

TRISTANI (GIAMBATTISTA AND ALBERTO), built 1553 the three-ailed church of S. Benedetto, at Ferrara; its leaning tower 124 feet high was built 1621-36; its monastery now in ruins was completed 1561.

TRISTANO (BAROLOMMEO), rebuilt before 1473 the transept and tribune of Sta. Maria in Guado (or Vado), at Ferrara; it was continued by B. Rossetti; and part restored 1830 by Gio. Tosi.

TRISUL EMBLEM; in Hindoo decoration. This is shown by FERGUSON, *Indian, etc., Architecture*, 8vo., 1876, in a cut on p. 104, from Amravati; and on p. 96, at Sanchi, on each side of the central ornament, the *chakra* or wheel, and forming the finish on the top of each post of the northern gate.

TRITON. A sea monster, half man and half fish, often used in classic and renaissance ornament. It is usually naked to the loins and holding or blowing a horn or trumpet considered to be formed by the shell of the murex. A good example, found on the Tenuta of S. Angelo, at Rome, is now in the gallery of Statues in the Vatican.

TRIUMPHAL ARCH (Fr. *arc de triomphe*). PLINY, xxxiv, 6, says that arches, like columns, to bear aloft the statue of some meritorious person, was a new practice (at Rome), an honour first taken from the Greeks (INWOOD, *Erechtheion*, fol., 1827, p. 156-7). The Romans are generally considered to have been the first people to erect these structures; the earliest were plain, and had a statue of the victor and his trophies on the summit; later

they became loaded with ornaments. The arch at Rimini, erected in honour of Augustus, is one of the oldest. They may be arranged in three classes: (a) A single arch, as that of Titus at Rome, Trajan at Ancona, Trajan at Beneventum, and de l'Etoile at Paris. (b) Two arches or arcades, as at Verona and Treves; these appear to have formed at the same time gates for the town. (c) Three arcades, that in the middle being the principal or grand arch, with a passage on each side; as that to Septimius Severus, also to Constantine, both at Rome. (d) Quadrifrontal arches, or double passages; as Janus at Rome; Caracalla at Tebessa; Aurelius Antoninus and Lucius Verus at Tripoli; Cavellon in France; and Laodiceia ad mare. (e) The lesser arch of Septimius Severus, also called "of the Goldsmiths", differs from the above in being flat-headed. "It would appear that all the principal Roman triumphal arches with single openings were square in proportion, either comprising or excluding their attics; that the centre from whence the archivolt was struck was the centre of the square; when the façade was more than a square, then where the two diagonals crossed the centre was fixed. The width of the opening is generally half the entire extent, sometimes three parts out of seven. They were generally surmounted by a group of figures, or the car and horses of the conqueror accompanied by his companions in arms and the trophies of war. This group appears to be equal to one-third of the entire edifice; the attic and entablature is one-third, and the columns and pedestal two-thirds; so the car, etc., were double the height of the pedestal on which they were placed. The depth of the arch varied; sometimes as deep as the width of the large opening; many were less; but the cube was generally the measure that bounded the proportions"; CRESY, *Encyc. of Civil Engineering*, 8vo., 1861; transferred to GUILT, *Encyc. of Architecture*, edit. 1867, 1876, and 1888. COLONNA, *Poliphili Hyponotomachia*, 4to., Venice, 1499, or *Song de Poliphile*, Paris, 1546, describes how to proportion an archway.

Ancient medals are very numerous bearing figures of arches, some of which have for centuries past ceased to exist. Some of the following arches are described under the cities and towns.

25. 96.

Athens, of Theseus and Hadrian. STUART, *Athens*. This trophy temple is like that of Octavius at Rome; INWOOD, *Erechtheion*, 1827, p. 72.

Rome. Titus, 79 A.D. VALADIER, *Ristauri di Arco*, 4to., 1822. C. in G. B. J. REYNAUD, *Traité d'Arch.*, Paris, 1850-58, pt. 2, pl. 50. Septimius Severus, 63 ft. high. SÜARES, *Arvus et Sep. Sev. Aug. Anagl.*, fol., 1676. C. in G. B. J. REYNAUD, pt. 2, pt. 51. Constantine, 312 A.D., 68 ft. high. TAYLOR and CRESY, *Arch. Ant. of Rome*, fol., London, 1821-22, gives these three arches in full detail.

GUALTANI, *I tre archi trionfali di Const., Severo, e Tito*, 8vo., Rome, 1815. "The triumphal arch of Constantine still remains a melancholy proof of the decline of the arts, and a singular testimony of the meanest vanity. As it was not possible to find in the capital of the empire a sculptor who was capable of adorning that public monument, the arch of Trajan, without any respect either for his memory or for the rules of propriety, was stripped of its most elegant figures; the difference of time and persons, of actions and characters, was totally disregarded. The new ornaments, which it was necessary to introduce between the vacancies of ancient sculpture, are executed in the rudest and most unskilful manner"; GIBBON, *Decline and Fall*, etc., chap. xiv.

Rome. Claudius Drusus, in the wall, gate of S. Sebastiano. B. J. Fabius, and many others. Galienus, or S. Vito, to Severus and Julia; opening 10 ft. wide. A list of 21 arches, and another of 11, is given in *Mirabilia Romæ*, in JORDAN, *Top. der Stadt Rom im Alterthum*, 8vo., Berlin, 1871, ii, p. 411; 608. CARISTIE, *Forum Romain*, fol., Paris, 1821.

Beneventum, of Trajan, 114 A.D., 52 ft. high. SERLIO, *Architettura*, fol., 1663, p. 186-9. C. in G. ROSSI, *L'arco*, 4to., 1716. B. J. NOLLI, *L'arco*, fol., 1739; 1770. ROSSINI, *Archi Trionfali*, 1836.

Ancona, of Trajan; to commemorate the restoration of the port. SERLIO, 194-5. NOLLI, *L'arco*, 1770. LALANDE, *Voyage en Italie*, 12mo., Paris, 1769.

ARCH. PUB. SOC.

Verona, Castel Vecchio, by Vitruvius Cerdio. SERLIO, 202. The above three are engraved in LANGLEY, *Ancient Masonry*, fol., 1736.

" Porta di Leone. SERLIO, 206.

" Double gateway. SERLIO, 210-11.

Spello, porta Veneris (and two others). SERLIO, 142-3.

Susa, of Augustus. MASSAZZA, *L'arco antico*, fol., 1750. LALANDE, *Voyage en Italie*, 1769.

Antiochia.

Naples, of king Alfonso. LALANDE.

Fano, porta Augusta or Maggiore. LALANDE. MANCINI, *Arco di Aug.*, 1826.

Carsoli (anc. Carsula). STARKE, *Travels*, 8vo., 1839, p. 546. 28.

Rimini, of Augustus. LALANDE. C. in G.

Vicenza. LALANDE.

Aosta, of Augustus; to commemorate the completion of the Via Flaminia.

Corinthian columns with Doric entablature. C. in G.

Perugia, of Augustus.

Florence, of grand duke Francis II, 1739 by Jado.

Leghorn, 1732 by F. Ruggieri.

Milan, della Pace, by L. Cagnola. VOGHERA, *Illustr. dell' Arco*, fol., 1838.

Paris. Porte S. Martin, for Louis XIV, 1674, 54 ft. square, three arches, one of 15 ft. x 30 ft. and two of 8 ft. x 16 ft.

" S. Denis, for Louis XIV, 77 ft. high, 77 ft. wide.

" Tuileries, or Carrousel; by Chalgrin, Goust, Huyot, and Blouet; 60 ft. x 45 ft. high; arch 14 ft., others 8 ft. 6 ins. PERCIER ET NORMAND, *Arc*, fol., Paris (1830).

" de l'Etoile, 1806, by Napoleon I, completed 1830. 161 ft. high, 146 ft. wide, 72 ft. deep, archway 47 x 67; arches at the ends 27 x 60; arch 179 ft. long by 79 ft. wide. CIVIL ENGINEER, ETC., *Journal*, 1839, ii, 159. THIERRY, *Arc*, etc., fol.

Aix. GALLAUP, *Les Arcs triomph.*, fol., 1701.

Langres, double and equal. LA BORDE, *Monuments de France*, fol., Paris, 1816, i, pl. 87.

Saintes, double archway on bridge. LA BORDE, i, pl. 24-5.

S. Remi, one archway. LA BORDE, i, pl. 33-4 and 85-6. B. J.

Autun, arc d'Arroux. LA BORDE, i, pl. 33-4.

Cavaillon, double passage, four sides. LA BORDE, i, pl. 35-9.

Carpentras, one archway. LA BORDE, i, pl. 104-6.

Orange, to Caius Marius, 74 ft. high (70 x 66 French). Three passages.

LA BORDE, i, pl. 48-52. B. J. CARISTIE, fol., 1839.

Lille, porte de Paris, 1682 by S. Volland.

S. Chamas, archway at each end of bridge. LA BORDE, i, pl. 26-28. B. J.

Besançon, porte noire. LA BORDE, i, pl. 110.

Reims, three passages. LA BORDE, i, pl. 111-5.

Nismes. Langres. Arles, demolished 1743.

Marseilles, porte d'Aix, 1823-32, by Penchaud; GOURLIER, ETC., ii, pl. 199-200.

Montpellier, porte du Pérou, 1691, by D'Orbay and D'Aviler.

The great analogy of style in the triumphal arches of Provence, Orange, S. Remi, Carpentras, render very probable the hypothesis which places their erection at the same epoch and for the same cause, the victories of Marcus Aurelius in Germany. The profusion of ornaments, the form of the arms, the incorrect and pretentious character of these monuments, become well the architecture of the 2nd century; MERIMÉE, *Midi de la France*, 8vo., Paris, 1835, 171.

Djinnia (Cuiculum); Hamman (Assura); Mukthar; Hydra; Tebessa (Theveste); Staitla; Zana; Lambessa; Sidi Abd Etabas; Tripoli; Timgad (Thamugas); GRAHAM in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1884-5, pl. lviii, lx. Antioe in Egypt. At Zarouan, is a fine arch, the only monument erect and almost intact.

Zara.

Pola, of Sergius Lepidus, small. SERLIO, 198-201. ALLASON, *Pola*, fol., 1819. LAVALLÉE ET CASSAS, *Istrie*, fol., 1802. C. in G. B. J.

Bara. TAYLOR, *Voyage en Espagne*, 1826-32.

Coppara in Catalonia. Alcantara.

Martorell, on bridge at; near Monserrat.

Cabanes. Merida.

Burgos, Porte triumphal de Sta. Marie. GAILHABAUD, *Arch. du Vm.*, 4to., 1854, iii, pl. 46.

Madrid; puerta de Alcalá, 1788, 128 ft. by 81 ft. with attic; by Sabatini.

" Puerta de Toledo, 1813-27, by A. Aguador.

Laodiceia ad Mare. Almost entire; four entrances; to Lucius Verus, 161-180; or Septimius Verus, 193-211. SHAW, *Travels*, 1757. POLOCCKE, *Descr. of the East*, 1743-5.

Palmryra. Two, in CASSAS, *Voy. Pitt. de la Syrie*, fol., Paris, 1798, i, pl. 65. WOOD, *Palmryra*, fol., 1753. CASSAS also gives one near Antioch, i, pl. 16.

S. Petersburg, of wood, near Riga gate, by Quarenghi, and replaced in granite, etc., by Starov. GRANVILLE, 1835, ii, 143-5.
Zarskoe selo, of iron, by Stassov, 1818, cast by Clark in 92 days. SVININE, S. Peter, 4to., 1816-28, ii, 181 at end.
The "Khudozhestvennaya Gazeta" for 1837, p. 361, gives a long article on these arches, including others in Russia.

Petromell (anc. Carnuntum), near Altenburg, temp. Tiberius, opening 30 ft. by 20 ft. wide; 48 ft. high; columns. 26.

Berlin, Brandenburger thor, 1789-93, by Langhans.
Trier, porta Nigra.

Munich. The Siegesthor, by Gaertner 1843, and Metzger 1850, surmounted by a bronze figure of Bavaria in a quadriga drawn by lions.

London. Green Park, 1827-8, by D. Burton.

" Buckingham palace, St. James's park, now at north east-angle of Hyde park, by J. Nash. LEEDS, supp. to BRAYLEY, *Edifices of London*, 8vo., 1838, p. 124-34.

PANVINUS, *Amplissimi Ornatisissimi Triumphi*, 4to., Antwerp, 1550. BERGIER, *Grands Chemins de l'empire Romain*, 4to., Paris, 1628. BELLORI, *Veteres arcus Augustorum triumphis*, fol., 1690. CHEVALIER, *Histoire de Guillaume III.*, fol., 1692. MAROT, *L'Architecture Française*, fol., Paris, 1727-51, contains ten designs by him. PIRANESI, *Arco trionfali*, etc., fol., 1753; and *Archi sparsi in Italia*, fol. NICHOLS, *Progresses James I.*, 4to., 1828, s. v. 1603, index. L. ROSSINI, *Gli Archi trionfali degli Antichi Romani sparsi per tutta Italia*, fol., Rome, 1836. STURM, *De Arcuationibus Arch. triumph. que Arcubus*, etc., 1718. NORMAND, *Arcs de Triomphe de l'Etoile, du Carrousel, et autres lieux*, 4to., Paris, 13 pl. OGILBY, *The Entertainment*, etc., fol., 1662, four by sir B. Gerbier at coronation of Charles II. PENNY MAGAZINE, 1836, p. 389, 489. DURAND, *Parallèle des Edifices*, etc., fol., Paris, 1800. DONALDSON, *Architectura Numismatica*, 8vo., London, 1859; and his *Triumphal Arches of the Romans*, at ROY. INST. OF BRIT. ARCHTS., *Sessional Papers*, 1855-56, p. 111. BUILDER JOURNAL, 1843, i, 531; ii, 531. 1886, li, 333, 371, 408, 444, the plates from Rossini, Baltard, Cunejo, Masquelier, and Gasparini (the article referred in the list by B. J.). F. BLONDEL, *Cours d'Architecture*, fol., Paris, 1683, ii, 571-602, gives twelve examples in outline from Serlio, and four others. CANINA, *Architettura Romana*, fol., Rome, 1834-43, pt. ii, 676-84; pt. iii, 473-96; and plates 184-200; a good collection.

TRIUMPHAL AVENUE or via regalis. An important and conspicuous feature of some Roman cities; as that in Pompeiopolis, in Cilicia; another to the praetorium or justice hall, at Gortyna; at Athens, mentioned by Pliny; the southern portion of the temple at Jerusalem; at Pessinus in Phrygia; at Antioch; and Palmyra, where it was 4,000 ft. long; at Phaselis and some other cities of Asia Minor; at Arsinoe and Gerasa. FALKENER, *Classical Antiquities*, etc., London, 1860, ii, 279-81.

TRIUMPHAL COLUMN; see MEMORIAL COLUMN.

TRIUMPHALIS; ARCUS; Chancel arch, see ARCUS.

TRIVIUM. The Roman name for the space where three roads meet: "quadrivium" where four roads meet. The same were school terms which comprehended the seven liberal arts: trivium included grammar, rhetoric, and logic, or the threefold way to eloquence; quadrivium included arithmetic, geometry, music, and astronomy, or the fourfold way to knowledge; DU FRESNE, *Glossary*.

TROAD and TROY. The land of Troy is situated at the north-western promontory of Asia Minor. According to HOMER, the Achaeans under Agamemnon utterly destroyed Troy, the capital of Priam, king of the Troes. Thracian hordes may early (VII cent. B.C.) have made havoc in the Troad. Greek settlements were then formed, as Ilium in the north, Assus in the south, and ALEXANDRIA TROAS in the west. The site of the Greek Ilium is marked by the low mound of Hissarlik, "place of fortresses", founded perhaps about 700 B.C. Xerxes went up to the Pergamon of Priam and sacrificed to the Ilian Athene. Alexander, 344 B.C. visited Ilium, saw the temple of Athene, and directed the town to be enlarged, after the battle of Ipsus B.C. 301. LYSIMACHUS gave Ilium a wall five miles in circumference and built a handsome temple to Athene; at the beginning of II cent. B.C., Ilium

was in a state of decay. Antiochus the great, 192 B.C., and the Romans entered 190 B.C.; others followed, but after the XIV cent. A.D. the place was lost to view. The modern discussion as to the site of Homeric Troy dates from LECHEVALIER's visits to the Troad in 1785-86. Hissarlik is only 112 ft. above the level of the open plain. He claimed the Bali Dag above Bunarbashi as being the true Pergamus, also expressed by CHOISEUL-GOUFFIER, MORRITT, HAWKINS, GELL, HAMILTON, and LEAKE; also TOZER, count von MOLTKE, FORCHHAMMER, KIEPERT, ERNST CURTIUS: but though at Bali Dag pottery and walls have been discovered, no thorough excavations have been made. Hissarlik was excavated by SCHLIEHMANN, *Troy and its Remains*, 8vo., 1875. He claims that Greek Ilium ceased at a depth of 6 ft., all the rest down to 52 ft. 6 ins. is prehistoric, and he divided the latter into five cities (plate in BUILDING NEWS JOURNAL, 1878, xxxiv, 264); and in *Ilios and the Trojans*, 8vo., 1880, added a sixth city, from some scanty vestiges of Lydian works at a depth of 6 ft. 6 ins. Homeric Troy he identifies with the third prehistoric city. In his *Troja, Recherches*, etc., 8vo., 1884, certain errors were admitted, and Troy was placed in the second, of which the area was now enlarged; and the Greek Ilium was taken to extend lower than 6 ft. below the surface; the others were again described, with the architectural and other objects, great gates and walls. The treasures from Troy exhibited at the South Kensington museum are now in Berlin. Temple of the SUN. Scelus or Scelus made, it is said, one of the gates of Troy. Dardanus, Thebe, and Thymbra were other towns in the Troad; also the temple of Apollo Smintheus, and Thymbraeus; FRANKLAND, *Travels*, 8vo., 1829, ii, 239. PULLIAN, *Photographs*, 1876. ATHENÆUM JOURNAL, 1854, No. 1398.

LECHEVALIER, *Voyage de la Troade*, Paris, 1802: notes by Dalzel, 4to., 1791. WALPOLE, *Memoirs*, gives a plan, 4to., 1818-20, p. 552, 559. GELL, *Topography of Troy*, 45 maps, etc., fol., 1804. MOREY, *Recherches Arch. dans la Troade en 1830*, 8vo., Nancy, 1854. SCHLIEHMANN, *Iliaka, Peloponnes und Troja*, in "Archæologische Forschungen", 8vo., Leip., 1869; his *Antiquités Troyennes, rapport sur les fouilles de Troie*, transl. by RANGÉ, 8vo., Paris, 1874; *Atlas des Antiquités Troyennes*, 4to., idem, 1874. EICHTHAL, *Le Site de Troie selon Lechevalier*, 1875. BRENTANO, *Lösung der Tro. Frage*, Heilbronn, 1881; and his *Troia und New Iliou*, 1882. JEBB, *Remains at Hissarlik*, in "Journal of Hellenic Studies", 1882, iii, 185-217. Homeric Troy in "Fortnightly Review", April 1884. FORCHHAMMER, *Erklärung der Ilias*, Kiel, 1884. ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, May 1877; and 1884-5, p. 157. ENCYCLOPÆDIA BRITANNICA, 9th edit., 1883, p. 577-83.

TROAS STONE. See ASSOS; LOCULUS; SARCOFAGUS; TRACHYTE.

TROCHILUS. The Greek name for the Roman SCOTIA, from trochilos and trochlea, a pulley, which it resembles as to form. "Trocles and slides", HORMANUS, *Vulgaria*, 4to., London, 1519, p. 244. It forms part of the base of an order, above the large torus; the base of the column of the Ionic temple on the Ilissus, but more so that of the antæ without the lower torus. . . approximates to the form of that of the columns of the Heraeum, or colossal temple of Juno at Samos, supposed to be one of the most ancient temples raised by Grecian art of the Ionic order. The shallowness of the scotia appears to be in disregard of the term σκóτος, but in analogy with the more ancient Greek name τρόχιλος; STUART, *Athens*, edit. Kinnard, fol., i, 1825, p. 33. The water moulding used in XIII cent. is similar; and several instances of its use have been found in Greek and Roman work. 1.

TROITZA monastery; Troitskoi monastyr, or Troizkoi Sergiew, near MOSKWA. FERGUSSON, *History of Architecture*, 8vo., 1867, ii, 357. 28. 50.

TROJA. A town in the province of Capitanata, in Naples, founded in XI cent. on site of the ancient Æcea. It is the see of a bishop. The cathedral dedicated to the Assumption of the Virgin, dates about 1093-1115; it has bold projecting buttresses,

and a large western rose-window, also two bronze doors dated 1119 and 1127, by Odericus of Beneventum; they were restored 1573: the ambo dating 1169 was brought from the ruined church of S. Basilio; SERRADIFALCO, *Monreale*, fol., Palermo, 1838, p. 62. The edifice is 167 ft. long and the nave 50 ft. wide. There are four parish churches, five monasteries, two nunneries, and a good seminary. S. NON, *Voy. Pitt. de Naples, etc.*, fol., Paris, 1781-86, iii, 12-8. Le duc de LUYNES, *Recherches sur les Mons. des Normands, dans l'Italie Méridionale*, 1844, pl. 6. 28. 50. 96.

TROJA or Troy; see TROAD.

TROLLOP (ROBERT) or Trollope, of York, descended from a line of stonemasons; 1655-58 designed and built the old exchange and town court, at Newcastle-on-Tyne, at a contract price of £2,000; and 1668 completed Capheaton hall, Northumberland, for sir John Swinburne, bart.; NEALE, *Seats*, 4to., 1818, iii. On 25 September 1657 he was presented with the franchise of the corporation. On April 24, 1671, the bishop of Durham granted a charter of incorporation to, among others, Robert and Henry Trollop. Henry, "freemason", was buried 23 November 1677, and Mr. Robert, "masson", December 11, 1686, according to the Gateshead register. At the east end of that churchyard is a heavy pile of brick and stone built by R. Trollop for his tomb (repaired between 1855-60); it is said that an image or statue of himself placed on the north side pointed to the town court, and under it were four well-known lines of 1789 traditional fame, in doggerel rhyme; BUILDER *Journal*, 1857, xv, 468, states they only existed as a joke made while Trollope was alive! BRAND, *Hist. of Newcastle*, 4to., 1789, i, 29. PENNANT, *Tour in Scotland*, edit. 1790, iii, 310. SURTEES, *Hist. of the County of Durham*, 1820, ii, 120. MACKENZIE, *Hist. of Newcastle*, 1827, ii, 751. NOTES AND QUERIES *Journal*, 3 Ser., 1863, iv, 354-5, 437: 5 Ser., 1876, vi, 396: and 6 Ser., 1885, xi, 14. GOULD, *Hist. of Freemasonry*, 4to., 1884, iii, 151.

TROMBARA (GIACOMO), of Parma, was architect to the empress Catharina II of Russia; 1792 designed the church of the Imperial mews, at S. Petersburg; and died about 1804. 68.

TROMPE. The French term for the hollow head of a niche as a corbel, to carry tourelles and passages. P. de l'Orme executed two at Lyon in the rue de la Juiverie (*Architecture*, p. 90a); one at the house of the banker Patoillet, rue de la Savaterie, at Paris; and many others of various sorts (*idem*), including the celebrated one now destroyed, at Anet; a *trompe* was for some centuries a touchstone for the skill of French masons; ORME (p. 35). A fine one exists at the house of François I at Orleans, given in *Archives des Commission des Monts. Franç.*, fol., Paris, 1855-72. Names are given to nine differing forms of trompes, by D'AVILER, *Cours d'Architecture*, 8vo., Paris, 1699, p. 249 of *Explication*, and by other writers, and plate 49, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1888, new series, iv, 48. 25.

TROND (GERHARD OF S.), G. de Sancte Trudone, G. van Sint Trond, magister Gerardus, and G. von Rile, is supposed to be the same as Gerhard von KETTWH who worked at Cologne.

TRONDHJEM; see THRONDHJEM, in Norway.

TROPHONIUS with his brother AGAMEDES are stated to have been sons of Erginus, king of Orchomenus, and to have built among other works a temple (the fourth) to Apollo at Delphi (rebuilt by Spintharus); another near Lebadea in Boeotia; one to Neptune near Mantinea; a treasury for Hyrieus, king of Hyria in Boeotia; and another for Angeias or Angeas, king of the Epeians in Elis. Anchasius is recorded by PAUSANIAS, ix, 11, to have built with them the *thalamus* of Amphitryon and Alcmena at Thebes in Boeotia. According to one account they robbed the treasury, when Agamedes was entrapped and Trophonius swallowed up by the earth; while some consider them to have been mythological personages. They are placed about a century before the Trojan war, *cir.* 1300 or 1400 B.C., *Scholias* on *Aristoph.* (Nub.), 508; and 600 B.C. has been named. PAUSANIAS, ix, 37, §3. STRABO, ix, p. 421. MÜLLER,

De Orchomenos und die Mynier, p. 97. BLOUET, *Morte*, fol., Paris, 1831-36, p. 15, says xv to x cent. B.C. DUDLEY, *Noology*, 8vo., Leicester, 1846, p. 346, 376. 3: 59. 68.

TROPICAL ARCHITECTURE. ECCLESIOLOGIST *Journal*, 1851, ix, p. 29, etc.; 1852, p. 204. T. R. SMITH, *Buildings for Tropical Climates, especially India*, read at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1867-68. (PUNKAH.) TANNER, *Ventilation in India*, 8vo., Loodiana, 1869. BURGESS, *Proposed School of Art, Bombay*, *idem*, Dec. 1867.

TROTTER BONE. Used in a small PAVEMENT.

TROTTOIR. A French and German name for a raised roadway, which architects have arranged along quays and bridges, in imitation of the *banquettes* to ramparts of fortifications. Also a foot pavement in a street, when raised by a kerbstone a few inches above the level of a carriage road. 5. 25.

TROUARD (LOUIS FRANÇOIS), born 1729 at Paris, was a pupil of Lorient. He gained 1753 the grand prix, 1754 went to Rome, was admitted 1769 to the academy of architecture; 1766-73 superintended the works under J. A. Gabriel of the new towers of Orleans cathedral; designed the third story or colonnades, which were added 1787-90 by his pupil P. A. Paris; he designed at Versailles, 1760 a chapel for the church or S. Louis; 1764-70 the church of S. Symphorien; 1773 a caserne in the place d'armes, destroyed 1831; and the decoration of the chapels and sacristy of S. Louis. LEROY, *Rues de Versailles*. LOUIS ALEXANDRE, his son and pupil, gained 1780 the grand prix.

TROUGH (Fr. *abreuvoir*). "Traughts for bakers or other professions or for conveyance of water," *cir.* 1632; JUPP, *Carpenters' Company*, 8vo., 1848, p. 301.

"Trough" is also an incorrect orthography of THROUGH. The west aisle of the south transept of Chester cathedral was termed the "trough aisle" on a plan drawn at the Dissolution; in British Museum, Harl. MS. 2073; LYSONS, *Magna Britt.*, Cheshire, 4to., 1810, p. 452. A mediæval coffin formed of a hollowed-out stone was called a trough; THROUGH STONE. 19.

TROUGH. A vessel having the sectional form of a prism, or truncated triangle, or a parallelogram, open only at the top, for holding water. It is made of various materials, and was formerly placed in front of roadside inns, and from which horses drank. It is now supplied in the streets of large towns, with smaller ones for dogs. A society in the metropolis has "erected 404 troughs for animals and 392 fountains", up to June 1, 1879. Troughs require constant care and supervision, and great cleanliness, as there is much risk of infection from the mucus of diseased animals; thus some proprietors insist on their cattle being supplied with water in pails. The "pen trough" of a water-mill is the channel through which the water flows to the wheel.

Of late years, among the sanitary inventions, a trough serving for the reception of human ordure has been introduced for schools and barracks. In one patent, a length of pipe arranged with a hole on the top serves as the closet, and a series of these pipes being joined together constitute a trough closet; one end of this trough is connected with the drain, and the other end with a self-acting flushing cistern, by which it is thus kept constantly clear.

TROUGH GUTTER. A square-shaped gutter formed of wood, below dripping eaves of common buildings, to convey the rain-water to the vertical trunk or pipe by which it is discharged. EAVES GUTTER. It is also the gutter formed with square sides along the middle of an M roof.

TROUGH ROOF (Span. *artesonado*). A carved ceiling made in the shape of an inverted trough; a term applied by Spanish writers, and used by FORD, *Handbook*, and by STREET, *Gothic Architecture*, 8vo., 1865, p. 220, etc.

TROWEL (Lat. *trulla*; Fr. *truelle*). A flat steel tool, more or less in the shape of a heart, pointed at one end and with a handle formed above it but beyond, to enable the artisan to use it flat when required. Steel for this purpose requires to be

carefully heated and hammered several times until experience has taught the maker to know by the feel, the sound of the blows, and the lessening degree of impression, when the steel is hammered enough, and that sufficient toughness, spring, and elasticity are obtained to suit them for the several purposes. To prevent the metal rusting when not in use at meal-times, the workman smears it over with the mortar. There are several sorts, according to the trade. A "brick" trowel is used to take up the mortar and spread it on the bricks: it is strongly made as bricks are cut with it when to be lessened or shaped on the scaffold, and also to stop the joints in brickwork. A "slating and tiling" trowel is to take up mortar and lay it on the tiles, to point the tiles, hips and ridges, and to torch slating. It is longer and narrower than a brick trowel; but that is often used for the purpose. For plastering, a "laying" trowel is used to lay hair mortar upon walls, lathed partitions, and ceilings; it is parallel, with a handle fastened in the middle of its back; sometimes a hand-float of soft pine 10 ins. long, 4 ins. wide, and three-quarters of an inch thick, is used for the same purpose. A "setting" trowel is less in size than the "laying" trowel; the face is kept very true and smooth and the edges rounded from the face. A "pointing" trowel is smaller still, so as to go into sharp angles of plasterer's work. A "gauging" trowel is triangular in shape, 7 ins. long and 3 ins. wide, but with the point rounded.

A silver, or ceremonial, trowel is usually made for use in laying the first or foundation-stone of a building, and is presented to the person who is invited to perform this ceremony; in like manner a silver spade is made and presented on cutting the first turf for a railway, or important road. Numerous examples of trowels have been given in the ILLUSTRATED LONDON NEWS, especially in 1849, xiv, 257 and 303; and other journals.

TROWELLED STUCCO. The best sort of plastering for the reception of paint. It is formed with lime putty and well-washed sharp fine grit on a floated coat of work, and such floating should be as dry as possible before the stucco is applied. In the last process the plasterer uses the setting trowel and gauging trowel. The ground to be finished being made as smooth as possible, the plaster or stucco is spread upon it to the extent of four or five feet square, and moistened continually with water applied by a brush; the workman then trowels the surface, alternately sprinkling and rubbing the face of the stucco, till the whole presents a fine even surface. Thus, by small portions at a time, he proceeds till the whole is completed. The water has the effect of hardening the face of the plaster, which when finished becomes as smooth as glass. **FACED WORK. FINISHING. PLASTERER'S WORK. STUCCO.**

TROWELMAN. A bricklayer so called at Yarmouth in 1662, and in Ely at the present time.

TROWEL POINT. In ornamentation; a succession of triangular indentations in a wall, or stringcourse; so called from its resembling the pressure of the point of a trowel; a sort of serrated edge like that of a saw. 19.

TROY or TROJA; see **TROAD.**

TROYES (Anc. Augustibona and Tricasses; later Trece). The capital of the department of Aube, in France, situated on the river Seine. It was plundered by the Normans in 889. The ramparts and most of the old timber houses have been removed. It was the ancient capital of the comtes de Champagne down to the xiv cent. NODIER gives plates of a door in the château of the counts of Champagne; the porte S. Jacques; court of the hôtel de Vieux Luisant; old houses in ruelle des Chats; and the rue Champeaux, du Mortier d'or, rue S. Donino, and de Cheval blanc. SIRODOT in DALY, *Revue Générale*, 4to., xiii, 1855, pl. 2, text 5-10, gives *épi* from three houses: and xvii, 1859, pl. 36-7, old constructions in brick and *cratic*. The hôtel Mesgrigny or Vauluisant with two turrets is a good renaissance work. GWILT, *Encyc.*, § 2031d, gives from VIOLLET-LE-DUC *Dict.* the manner in which the timber houses were constructed. It is the see of a bishop.

The cathedral dedicated to SS. Pierre and Paul had the apse and its chapels built 1208-23, the choir and transepts were completed 1314-5. In 1365 Thomas was "masson de l'œuvre"; 1372 Michelin de Jonchery; 1401 T. Michelin; in 1419 Ogier Faigot began the portail and walls, his sons Thevenin and Jean being employed with him; consecrated 1430; 1462-85 Antoine Colas; and 1485-1528 ... Garnache succeeded; 1506-12-19 the portail was commenced by M. Chambiges (his son P. Chambiges was employed from 1509), who also inspected the works, and the two towers carried out by Jean de Soissons or de Damas, mason, 1509-19-31, and succeeded by J. Bailly. The north-west tower of S. Paul, which was 355 ft. high, was injured by lightning 7 Oct. 1700, and is now 192 Fr. and 202 Eng. ft. high: the tower of S. Pierre was built 1559-68 by G. Favereau and by G. Faulchot. The edifice is five-aisled with chapels beyond; the triforium is a narrow passage. There are three fine round windows, rich stained glass of xii and xv cent. in clearstory; and handsome pavement in the choir. In 1620-38 the works were resumed by G. or E. Baudrot. The fine jubé was commenced 1382 by J. Thierri and Michelin de Jonchery (or de TROYES), and stopped 1382 by Henri de Bruxelles, mason, who executed another 1383-1400, with Henri Nardau (PUGIN, *Chancel Screens*, 4to., London, 1851, p. 55); it was destroyed 1793. VIOLLET-LE-DUC, *Dict. Rais.*, 8vo., 1856. FERGUSON, *History*, 1865, i, 499. The piers of the transepts giving way in 1840 the vaulting fell, since which the edifice has been under restoration by Viollet-le-Duc who almost rebuilt the choir. The edifice is 374 or 394 ft. long, 168 ft. wide, and 96 ft. high.

The church of *S. Jean* has a narrow and low nave, xvi cent.; in it on June 2, 1420, king Henry V of England was married to Catherine of France; 1511 Jean Oudot with Jean and Huguenin Bailly and Grandjean reported on the works: the lofty choir dates 1524 (renaissance). *Ste. Madeleine*, choir and apse rebuilt 1508-17, by J. Gualde, Gaide, or Gaylde, called Grand-jean, master mason, and consecrated 1519; it is termed "very beautiful"; the rich jubé is of same date and by same mason, who is buried under it. GAILHABAUD, *Movemens*, 4to., Paris, 1842-52, iii; NODIER, *Voyages Pitt.*; ARNAUD, *Dép.*, etc., p. 198; PUGIN, *Chancel Screens*, 4to., London, 1851, p. 56; FERGUSON, *History*, i, 531; etching by Chapuy in LA BORDE, *Mons. de France*, fol., 1816-36, ii, 206. *S. Urbain* was begun 1262, finished with transepts 1266, nave piers raised and three west doorways completed 1284 (since restored) and then left; it is a fine example of the Decorated period; in a Bull of 1267 J. Langlois is styled maître de l'œuvre, he left to go to the crusades. *S. Nicolas*, cir. 1517 by G. Faulchot, and 1575-89 by R. Mauvoisin, has a handsome façade. *S. Remi*, nave and transept of xiv cent., with fine spire. *S. Pantaléon*, 1524-27, late Gothic and a west Italian façade; glass en grisaille. *S. Nizier*, xvi cent., late Gothic, west façade (Italian); north and south portals flamboyant; perhaps by Dominique and Gentil who also did those at S. Nicholas, S. Frobert, and S. André. The chapelle de *S. Gilles*, end of xiv cent., is of timber. NODIER gives plates of S. Pantaléon, S. Urbain, Madeleine, S. Pierre, S. Nizier, S. Jean Baptiste, and S. Nicolas. INKERSLEY, *Romanesque*, etc., *Arch. in France*, 8vo., 1850. ASSIER, *Comptes de la fabrique de l'église Ste. Madeleine*, 8vo., Troyes, 1854; *Comptes de l'œuvre de l'église de Troyes*, etc., 8vo., 1855; *Construction d'une Notre Dame au xiii siècle—comptes de l'œuvre de l'église de Troyes au xiv siècle*, 12mo., Paris, 1858; *Les arts et les artistes dans l'ancienne capitale de la Champagne*, 1250-1680, 12mo., Paris, 1876.

The episcopal palace is by M. Chambiges. The hôtel de ville designed by F. Mansard was carried out 1624 by L. Noble and completed 1670 by P. Cottard and Louis; the stone façade is of good design; NODIER. The prefecture is part of an abbey. The hôtel Dieu, xviii cent., is good and has a well-wrought iron railing next the street, by Delphin. The palais de justice. Hospice de S. Nicolas 1840, by M. P. Gauthier (GOUILLER, etc., *Choix d'édifices*, fol., Paris, 1825-50, ii, pl. 282-3), who also designed 1837-41 the halle aux blés (GOUILLER, ii, pl. 269). The

fishmarket is given in NODIER. There are also the museum, large public library, theatre, abattoirs, and gaol. VAYSSÉ DE VILLIERS, *Itin. Descr. de la France, or Descr. routière de l'empire*, 8vo., Paris, 1813-39. AUFAYRE, *Anciens édifices de T.*, 4to., 1853; and *Album Pitt.—du dép. de l'Aube*, 1852. TRIDON, *Troyes, etc.* NODIER ET TAYLOR, *Voyages pittoresques* (Cham-pagne), fol., Paris, 1843-45, as noticed above. LANCE, *Dict. Biog.*, 8vo., Paris, 1872. ARNAUD, *Dép. de l'Aube, etc.*, 4to., Troyes, 1837, p. 198. *Illustrations*, s. v. Buttress.

The churches of Pont Ste. Marie, and of S. André, each about three miles distant, have good XVI cent. flamboyant façades, glass, etc. 14. 28. 50. 96.

TROYES (MICHELIN DE); see MICHELIN; possibly Pierre Michelin de Joncheri, who with J. Thierri was concerned on the jubé in Troyes cathedral; these works were stopped by Henri de Bruixelles, who 1882 with Henri Nardau gave a new design in competition with Michelin; it was completed 1400, and destroyed 1793. PUGIN, *Chancel Screens*, 4to., London, 1851, p. 56.

TROYES, or TROYES WHITE. See BLANC D'ESPAGNE, or Spanish white, commonly called WHITING.

TROZO (F.); an error for TREZO (F.).

TRUCKLE BED. In the regulations of bishop Waynflete for the lodging of the scholars, it was ordered that each of the rooms on the ground floor should hold two principal beds and one truckle bed; the chambers over them each two truckle beds; the nobles entertained by the bishop slept on truckle beds, two or three in a room; TURNER AND PARKER, *Dom. Architecture*, 8vo., 1859, iii, 100. TRUSSING BED.

TRUDONE (GERARDUS DE SANCTO); see TROND (S.).

TRUG AND TRUGG. A utensil used in some counties as a HOD, or TRAY, to carry mortar in. 2. 4.

TRUJILLO or TRUXILLO. A town of Peru, founded by Pizarro, in the valley of Chinu. It is the see of a bishop, and has a cathedral and several large churches, a college, hospital, and theatre. Near the town is a vast space covered by tumuli and other ancient remains; also the palace of Chinu Canchu at Manriche, the finest in Peru. RIVERO AND TSCHUDI, *Antiquidades Peruanas*, 4to. and fol., Viena, 1851, pl. 58, p. 268, 327. TSCHUDI, by ROSS, *Travels in Peru*, 8vo., 1847. SQUIER, *Peru: Incidents of Travel*, 8vo., 1877. 50.

TRULLIZATION. A term used by VITRUVIUS. In ancient architecture, all kinds of couches or layers of mortar, wrought with the trowel in the inside of vaults; or the hatches made on the layers of mortar to retain the lining of the *strivæ* (the fillets which separate the *striges* or flutings of columns). 4. 25.

TRULLUS. The Latin name for a cup, hence used for a round edifice by SUICRIUS and ALLATIUS; as the Pantheon at Rome; or part of a church as Santa Sophia, the body of which was built in the form of a *trulla*, yet the whole was oblong. BINGHAM, *Origines*, 8vo., London, 1840, ii, 391.

TRUNCATED. A term employed to signify that the upper portion of a cone, pyramid, sphere, or other solid has been cut off. The part which remains is called a FRUSTUM.

TRUNCHEON. A column in truncheon is described 1700-36 as consisting of 3, 4, or 5 pieces of stone or metal, being higher than the diameter; and differing from the tambour (less high than the diameter of the column). 4.

TRUNK. An old term for the *fust*, or shaft, of a column. The die of a pedestal, also called *truncus*. A wood down-pipe for the conveyance of water from a roof. 1. 2. 4.

TRUNK ARCH. One of which only the intrados, and not the face, is seen; PAPENDIEK, *Synopsis*, 8vo., 1826, p. 70.

TRURO. A city and port in the county of Cornwall, in England, situated at the confluence of the rivers Kenwyn and S. Allen, over which is an old bridge. It is one of the coinage towns; and is the see of a bishop created 28 August 1877. Of the parish church dedicated to S. Mary dating from 1518, only the aisle 76 ft. long, 17 ft. wide, and 29 ft. high has been retained in the new cathedral (Early English) from the design of

ARCH. PUB. SOC.

J. L. Pearson, R.A., of which the first stone was laid May 20, 1880. The nave is 130 ft. long, 29 ft. wide, and 70 ft. high; its aisles 95 ft. by 13 ft. 6 ins. by 30 ft.; the crossing 34 ft. by 34 ft. by 115 ft. to top of lantern; the choir 112 ft. by 29 ft. by 70 ft.; its aisles 112 ft. by 13 ft. 6 ins. by 28 ft.; the choir transepts are 22 ft. wide and 70 ft. high and project 6 ft. beyond the aisles; the great transepts 110 ft. by 27 ft. by 70 ft.; in the north transept are east and west aisles 28 ft. by 12 ft. by 28 ft.; in the south only a west aisle of same dimensions. The west tower is 15 ft. square. South of the south-choir aisle is a second aisle 7 ft. wide joining to the south aisle of the parish church, to which a west tower has been added, connected with the south transept. The external length is 284 ft., width 73 ft., and the transepts 117 ft. BUILDING NEWS *Journal*, 1879, xxxvi, 552, and other *Journals* for the year. Plan, etc., in BRITISH ARCHITECT *Journal*, Nos. 18 and 19, Nov. 1887. There are also the churches of S. John; of S. Paul; and of S. George which with its schools and parsonage were built 1858. Near the town is the church of S. Michael Penkevil, 1261, XIV cent., rebuilt by G. E. Street, who retained the oratory and old stone altar in the tower; *Restoration, etc.*, read at Roy. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1862-63; and 1889. TREGELLAS, *Tourists' Guide to Cornwall*, 5th edit., 8vo., 1887. The museum of the royal institution of Cornwall; the county library; the Truro institution lecture-room, and the museum and library of the royal horticultural society of Cornwall; assembly rooms; a granite Doric column in memory of John and Richard Lander, African explorers, the statue by Berndid; the new town-hall and market, 1847, by C. Eales (BUILDER *Journal*, v, 551); and Cornish bank 1858 by W. White, F.S.A., are among the chief public edifices. 14. 28. 50.

TRUSS (Fr. *console*; Med. *corbel*). The name given to a CORBEL; and frequently a BRACKET assumes the same composition, formed by the junction of a CONSOLE with a CANTILEVER, or other corbel; as in Vignola's celebrated entablature (CHAMBERS, *Civil Arch.*, Composite order, pl. 2). It may be used reversed, and is then called a cantilever truss. The word "truss" in classical architecture is very useful, in affording a name for any ornamental corbel of very large size, as there is generally some adjunct required to the corbel which is the foundation of the design in order to reconcile it with the other portions of the work to which it belongs. In Gothic and later architecture, the projection carrying an oriel window, tourelle, and the like, is called a corbel. MODILLION. BLOCK. BRACKET.

TRUSS (Fr. *trousse*). To strain or keep tight. The term is applied in carpentry and iron framings to a triangular frame, and to a polygonal frame, to which rigidity is given by staying and bracing, so that its figure shall be incapable of alteration by turning of the bars about their joints; RANKINE, *Applied Mechanics*, 4th edit., 1868, p. 144. A truss should consist of a combination of triangles, in order that any pressure at the top may find some counter-resistance from below. It differs from a FRAME as commonly used in joinery, which mostly consists of rectangular parts. Most roofs require trusses to support the rafters which are to carry the covering. Partitions require to be trussed when unsupported below, or have to carry a weight above. A truss, whether of timber, or iron, should be so arranged that if supported at two given points, and charged with one or more weights in certain others, no part would press transversely upon another except by strains exerting equal and opposite forces. In a roof it is called "principal, or principal truss". An ordinary timber truss for a roof consists of a pair of inclined timbers, called *principal rafters*, framed at the apex into the head of the king-post, the feet being secured to the ends of a *tiebeam*; the middle of this beam is held up from sagging by an upright timber called *king-post*. To prevent these inclined timbers from sagging, a *strut* or small length of wood is placed from near the foot of the king-post up to the underside of each, hence all is strutted or held together. A truss of a longer span has two posts called *queen-posts*, instead of one, with other struts

and beams. BRACE. COLLAR BEAM. JACK TRUSS. KING POST. RAFTER. STRUT. STRAINING BEAM. SIDE POST. QUEEN POST. TIEBEAM. Other timbers are required to form a ROOF. CARPENTRY. HAMMERBEAM. BENT TIMBER. PRINCIPAL.

ROBERTSON, in *Building News Journal*, 1876, xxxi, 3. STONEY, *Theory of Strains in Girders, etc.*, 8vo., 1869. RANKINE, *Applied Mechanics*, 8vo., 4th edit., 1868. HUMBER, *Cast and Wrought Iron Bridges and Girders*, 4to., 1856-7. TARN, *Science of Building*, 8vo., 1870. WARR, *Dynamics*, 8vo., 1851.

TRUSS for sustaining decayed or sunk timbers. See BEAM for methods by F. Richman; A. Ainger; J. B. Papworth; and mess. Mallet. BLOORE, *Plan, etc.*, of a curious Truss that was used to raise the roof of Clapham Church, 8vo., London (1800 ?); it had sunk eight inches in the middle: SOCIETY OF ARTS, ETC., *Transactions*, for same date. DENISON, *Failure of Roof of the Chapel of the Royal Artillery Barracks at Woolwich, and Restoration of Principals*, in *ROYAL ENGINEERS, Papers*, 4to., 1840, iv, 219.

TREDGOLD, *Carpentry*, 4to. (Weale), 4th edit., 1853, pl. 39, gives three executed trusses for floors, 36 ft. 6 ins., 35 ft., and 52 ft. span. Truss to staging for erection of arched ribs of central transepts at Crystal palace, *BUILDER Journal*, 1853, xi, 603.

MOXON, *Mechanick Exercises* (Carpentry), 4to., 1679, p. 11, marks the "king peece or joggle peece" in the roof as the "truss".

TRUSSED BEAM OR GIRDER OF TIMBER. One in which the combination of a truss is inserted between and let into the two pieces whereof it is composed; or is formed above or below the solid beam. JOUSSE is one of the earliest writers to show this second method; and others are shown and explained in GWILT, *Encyc.*, 1888, p. 619. "In trussing a girder, the main object is to strengthen the weakest point—the centre of the beam—and as Barlow's experiments upon direct queen-bolt trusses, and our own upon inverted or suspension trusses, of two angular points, indicated that no advantage was derived from either, when strained in the middle, we are strongly disposed to conclude, that whether the truss acts by tension or by compression, it should (in most cases) have but one angular point." MACCLURE and MORRIS, *Experiments*, in "American Journal of the Franklin Institute", printed in *CIVIL ENGINEER, ETC., Journal*, 1842, v, 291-3. *BUILDER Journal*, 1848, vi, 495, at Middlesex Hospital; p. 176. Coombs's new method, *B. J.*, 1859, xvii, 265, 300, 309. "Calculation for Strength", *B. N. J.*, 1869, xvi, 214; *idem*, 1870, xviii, 352; 407.

BOW BEAM. BOW AND STRING BEAM AND GIRDER. LAVES. GIRDER (38a). FLITCH GIRDER. TENSION ROD. 1. 14.

JOUSSE, *Le Théâtre de l'Art de Charpenterie*, fol. edit., 1550, p. 147; or edit. 1627, p. 151. LANGLEY, *Masonry*, fol., 1736, by J. Smith, pl. 375; by F. Price, 382. KRAFFT, *Charpente*, fol., Paris, 1819-22-40: and *Charpenterie*, fol., Paris, 1805 and 1820. ROMBERG, *Zimmerwerks baukunst*, 4to., Leipzig, 1846-50, pl. 65. VIOLET-LE-DUC, *Dict.*, s. v. *Charpente*, 8vo., Paris, 1856, p. 56-7.

TRUSSED BEAM OR GIRDER OF IRON. Experiments are given in FAIRBAIRN, *Application of Cast and Wrought Iron*, 8vo., 1870, 4th edit., 41-5 (or p. 51-2 of earlier date), who concludes, "Under the most favourable circumstances, there is not much gained in the strength of cast-iron beams by the addition of malleable iron truss-rods, whilst their uncertain and variable character render them dangerous in actual use. . . . What is infinitely preferable is a well-constructed malleable iron beam, which may be made of almost any given strength, and of any span within the limits of 500 to 1,000 feet." TENSION ROD. *BUILDER Journal*, 1847, v, 294; 1848, vi, 136; 329. In fire-proof buildings, failure; INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, vi, 214-23. Wrought-iron truss; SOCIETY OF ARTS, *Transactions*, 1827, xlv, 125, pl. 7. Blackwall extension, trussed girder over Commercial road east, 130 ft., by Joseph Locke, C.E.; in *ILLUSTRATED LONDON NEWS*, 1849, xiv, 13; and *ALLGEMEINE BAUZEITUNG*, Ser. 2, pl. 483.

TRUSSED GIRDER BRIDGE OF CAST IRON. The bridge

at Stockton, over the river Tees, by R. Stephenson, 83 ft. 6 ins. span, and 90 ft. long, is the first (1843) or one of the earliest applications of malleable iron in tension-rods to cast-iron girders of such extended spans: it has been strutted since the failure of the Dee bridge at Chester (*CIVIL ENGINEER, ETC., Journal*, 1849, xii, 7). Northern and Eastern railway at Tottenham, over the river Lea, 70 ft. long, 66 ft. span, by G. P. Bidder. York and Scarborough over the river Ouse. Near Chester, over the river Dee, twelve of 98 ft. span, each 109 ft. long, by R. Stephenson, C.E. (failed 24 May 1847). Wakefield and Goole railway, over Knottingley canal, 88 ft. 6 in. span. Calder bridge, ditto, 50 ft. span; North Union Railway, by C. B. Vignolles. The High Level bridge at Newcastle-on-Tyne is another example. DEMPSEY, *Tubular, etc., Iron Bridges*, 12mo. (Weale), 1850. GAUTIER, *Traité des Ponts*, fol., Paris, 1716 (best edition 1728), pl. xix. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, vi, 220, which 224 gives the factors of safety. At Bezons, over the river Seine, 1845, of seven arches of 80 ft. span; in *BUILDER JOURNAL*, iii, 71.

A Gothic arch iron truss-bridge, of a novel character, devised by Thayer, of U.S.A., is shown in *CIVIL ENGINEER, ETC., Journal*, 1854, xvii, 336.

TRUSSED PILES in foundations. A process for securing the heads of piles from moving, is described in *BUILDER Journal*, 1844, ii, 292.

TRUSSED PURLIN or latticed timber truss. The trussed purlin is of service when circumstances require that the main trusses should be at a considerable distance apart; they also serve to stiffen the roof and keep the main trusses vertical. The central hall of the assize courts at Manchester is 100 ft. long, 48 ft. 6 ins. wide, by 75 ft. high. The roof is supported by hammer-beam principals, and divided into seven bays—the thrust is not thrown wholly on to the side-walls, but is supported, in great measure, at any rate, by latticed timber trusses 16 ft. 6 ins. deep, running along the whole length of the hall, at each side, and resting on the gable walls. These trusses carry king-post principals supporting the upper portion of the roof, while the massive wall-brackets steady the girders. WATERHOUSE, *Manchester Assize Courts*, read at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 12 June 1865.

TRUSSED RAFTER ROOF, or single framed roof, in Gothic work, of XII and XIII centuries, one having a collar-beam connecting the rafters. Sometimes having only diagonal braces connecting the rafters, when the span is small as to a porch. In wider spans, even without a tiebeam, each pair of rafters had the collar-beam stiffened by braces crossing at times above the collar, and at others tenoned into its under-side, and then a second collar was put between the first and the ridge; the whole tightly pinned together with oak pins. Such roofs were frequently boarded underneath, thus forming a polygonal barrel-vault. Moulded ribs were added, dividing the boarding into panels, with carved bosses at the intersections; as at Wimbotsham church, Norfolk; the angle of the roof is 78°. GWILT, *Encyc.*, 1888, p. 636. BRANDON, *Open Timber Roofs*, 4to., 1849. HAMMER-BEAM ROOF.

TRUSSEL and trestle. See TRESSEL and HORSE. A wooden prop, upholder, or support. 2. 4. 19.

TRUSSING. In carpentry and shipbuilding, consists of diagonal braces disposed in triangles, the sides of which give to each other a mutual support and counteraction. TRUSSED BEAM.

TRUSSING BED. It was a bed used in Tudor times in England, which packed into a chest for travelling. In cases of frequent removal it must have been found convenient. John of Ghent, or Gaunt, appears to have always slept in such a bed. HUNT, *Tudor Architecture*, 4to., 1836, p. 158. TRUCKLE BED.

TRUSSING PIECE. The timber in the truss of a roof which is in a state of compression. 2.

TRUSS IN LEDGEMENT. Within certain limits, a building rectangular or polygonal on plan may be roofed without

principals or tiebeams, by firmly binding the ends of the plates together so as to prevent them spreading; these limits may be exceeded and the plates prevented from yielding laterally by adopting the system known as "truss in ledgement"; viz., by framing each side of the roof as a truss, whereby the tiebeams rest obliquely on the walls and become plates. In a building oblong on plan, the two sides would be covered with queen-post trusses (in which the collar-beams would touch each other and form the ridge and the principal rafters would form hips) and the two ends with king-post trusses. In the case of a rectangular or octangular roof, such as a spire, four or eight trusses laid "in ledgement", i.e., inclining to a common centre at the apex and firmly bolted together at the plates and other points of contact, make a very strong roof. LEDGEMENT. R. R. R.

Work framed from a setting out on a floor, instead of from actually setting it up and then taking it down again. W. T.

TRUSS PARTITION. One containing a truss within it, generally consisting of a quadrangular frame, two braces, and two queen posts, with a straining-beam between them, opposite to the top of the braces. BRACE, with diagram.

TRUSS ROOF; see TRUSS.

TRUTH. "Design in beauty, build in truth"; the motto of the Architectural Association, of London. "Truth" forms one chapter in RUSKIN, *Seven Lamps of Architecture*, 8vo., 1855, 2nd edit.

TRUXILLO; see TRUJILLO, in Peru.

TRY (Fr. *trier*). To bring to a test: a corruption of true. To plane by the rule and square only. "The 'fore (or jack) plain' only prepares the wood by taking off the irregular risings, so that the 'smoothing plane' or 'joynter' may afterwards the easier work it 'try'." The rule is used "to try the straightness or flatness of work", by applying its edge to the flat of the wrought side and bring the eye as close as possible to see if any light can be seen between the edge of the rule and the work; "if no light they conclude the work is 'try' and well wrought"; Moxon, *Mechanick Exercises* (Joinery), 4to., 1678, p. 62; 101.

TRYING PLANE. A plane used in carpentry after the jack plane, and with it a shaving is taken the whole length, instead of short lengths as by the jack plane. This plane is also used by plumbers for planing straight the edges of sheet lead when a regular and correct line is requisite.

TRYING UP. The operation of using the trying plane. This term, and "offer up", is applied when an ornament, moulding, or other detail has been roughed out, and it is desirable to judge of its effect when in position before it is wrought or cast.

TRYMER. See TRIMMER.

TRYPHON. A native of Alexandria, architect in Apollonia, who in the time of Demetrius Poliorcetes, first king of Macedonia (died 283 B.C.), in a siege of the city, carried mines beyond the walls and hung brazen vessels therein, which resounding, showed the direction of the mining operations of the enemy. VITRUVIUS, b. 10, c. 22.

TSARSKOE-SELO; see Zarsko-selo, near S. PETERSBURG.

TSE TAN, or varnish tree; see MO-WANG.

TSHORUM; see TAVIUM.

TUAM. A town in Connaught in Ireland, situated on the river Harrow, over which is a bridge leading from the marketplace in the centre of the town. The see dates from VI cent.; 1152 it became archiepiscopal, and in 1839 a bishopric; the sees of Killala and Achonry were annexed in 1835. The protestant cathedral, dedicated to S. Mary, was a XIV cent. building with portions of Norman work and rich traceried windows. The new edifice (early XIII century period) was designed by sir Thomas Deane, who retained the fine red sandstone chancel-arch 1128-50, and built the new cathedral eastward of the old chancel. The choir is 43 ft. long by 23 ft. wide; transepts 29 ft. wide; nave having five arches 23 ft. wide with aisles 11 ft. BUILDER *Journal*, 1858, xvi, 457; 1861, xix, 668; 1863, xxi, 33, 141, and

controversy 177, 605, 634; 1864, xxii, 260. DUBLIN BUILDER *Journal*, 1861, iii, 626. PETRIE, *Eccles. Arch. of Ireland*, 8vo., Dublin, 1845. The R. C. cathedral of S. (rich decorated or perpendicular period), was commenced 1827 and opened 1836; it is 173 ft. long by 137 ft. wide through the transepts; the nave 33 ft. wide; aisles 17 ft.; steeple 190 ft. high. The high altar of rich marbles was sent from Rome (COMPANION TO THE ALMANACK, 1837, p. 233). There are numerous parish churches and chapels. The cross, dating *cir.* 1128-50, was formerly in three pieces owned by three persons, but was re-erected before 1878. There are two bishop's palaces; the college of S. Jarlath or seminary; numerous schools; court-house; market-house with reading-room over, and other town edifices. 14. 28. 50. 96.

TUBBING. A wood or cast-iron tub formed in a shaft or sewer for stopping back of water where brickwork is not available in consequence of the flow of water preventing the setting of the cement. A useful description of the means employed in Ireland, and of sinking through quicksands in the north of England, is given in the MINING JOURNAL, and in CIVIL ENGINEER, *ETC.*, *Journal*, 1841, iv, 292-3. The system was used in parts of the sewerage works at Norwich about 1871 by A. W. Morant, C.E. SMILES, *Life of Stephenson*, 8vo., 1868, iii, 352, and 1874, p. 234.

TUBE and TUBING. Writers and manufacturers make little difference between a circular cylinder or a pipe, and a tube; the latter term may often be seen applied to a hollow article, square or rectangular in shape. It is applied equally to those used for supply of water, gas, heated air, and in ventilating purposes. AQUEDUCT. EARTHENWARE. FLUE. GAS. TUBULAR. WATER. *Strength of malleable iron tubes*, in FAIRBAIRN, *Brit. and Conway Tubular Bridges*; in ARCHITECT *Journal*, 1849, i, 271. A casting of a 4-in. iron tube, 50 ft. long, and one ton in weight, was effected 1862 at Salford; Cast-iron pipes are usually 9 ft. long (BUILDER *Journal*, xx, 863) and cast vertical, so that scoriae may rise to the top. *Drawn steel tubes* for water-supply instead of wrought iron welded tubes, are advocated in B. J., 1864, xxii, 174. *Rock concrete tubes* have been made for sewers, from 15 ins. to 36 ins. diameter, at Poole, Dorsetshire, 1886. *Inlet tubes and inlet bracket tubes* have been extensively used for ventilation since their introduction by messrs. Shorland, and by M. TOBIN in 1875; filters and other contrivances have been since supplied to them to render the air free from impurities.

Welded iron tubing is used for conveyance of gas and steam; the best quality is known as "steam-pipe". "Flexible metallic tubing" is designed to take the place of the india-rubber or gutta-percha now largely used for the purposes of gas and steam connexions, fire-hose, etc. It is stated to withstand the internal pressure of 240 lbs. per square inch, and an external pressure of 840 lbs., July 1889.

TUBE CHIMES. See TUBULAR BELLS.

TUBERTINI (GIUSEPPE), born 1759, was a pupil of G. Jarmorini. He became architect to the *comune* of Bologna, where he designed the arena for the game of pallone; completed 1787 the cupola of Sta. Maria della Vita (built 1686 by G. Borgonzoni); 1788 designed the church of S. Giobbe oratorio; and 1792 decorated the *sala* on the first floor of the *registro*. He died 1831.

105.
TUBE WELL. The "American tube well" system was introduced by Norton of Manchester 1867, consisting of an iron pipe 1½ in. diameter, about 12 ft. long, pointed at one end, and perforated with holes about 16 ins. up from the lower end. A movable iron clamp is fitted round the pipe, and a 56 lb. hollow weight round it is raised, and allowed to drop upon the clamp: thus the pipe is driven into the ground. Earth, sand, etc., first enter the pipe through the holes, and, when these are pumped out, the theory is that pebbles rest against the pipe and form a natural filter. When rock is to be bored the operation is more costly. One of these wells, to the depth of 15 ft., has (1867) been sunk in the Manchester Botanical Gardens. At an experiment, water was reached in five minutes, and in twenty-two minutes

a depth of 10 ft. had been reached; the pump had been fitted to the top of the well, and a flow of water obtained. The inventor accompanied the Northern army in the late American war, and procured an unfailling water-supply. *BUILDER Journal*, 1867, xxv, 688. It is also known as Norton's patent Abyssinian tube well, from its great use in the war in that country.

TUBULAR BEAM or GIRDER OF IRON. Experiments on a cast beam having regard to the interior and exterior diameters, are detailed in *TURNBULL, Cast Iron Beams and Columns*, 8vo., 1832, p. 55. A wrought iron tubular girder 32 ft. span for the front of messrs. Sarl and sons' premises in Cornhill, designed by J. Barnett, is given *CIVIL ENGINEER, ETC., Journal*, 1857, xx, 207. **HOLLOW CAST-IRON GIRDER.** **BOX BEAM.** **CELLULAR BEAM.** **GIRDER.** **PLATE IRON GIRDER BRIDGE.** C. G. SMITH, *Wrought Iron Girder-work*, read before the Liverpool Engineering Society; reprinted in *BRITISH ARCHITECT Journal*, 22 June 1877. **HUTCHINSON, Girder Making and Practice of Bridge Building in Wrought Iron**, 8vo., 1879.

TUBULAR BOW BRIDGE of wrought iron. The framing consists of an arched or bow tube, with a horizontal stringer tube or chord carrying the roadway, and deriving its strength from the arched tube rising above it, through the medium of suspending bars and braces. This system appears to have been first suggested by W. C. Harrison, C.E., and was designed by him. Over the river Ouse in Norfolk for railway, 170 ft. span, 15 ins. rise of tube. At Blackwall railway extension 120 ft. long, 116 ft. 8 ins. span, by capt. Simmonds. *CIVIL ENGINEER, ETC., Journal*, 1848, xi, 1; 300; and with others in *DEMPESEY, Tubular, etc., Bridges*, 12mo., 1850 (Weale).

TUBULAR CHIMES AND BELLS. Harrington's patent tube chimes were brought out about 1884. They consist of a series of metal tubes in suspension, harmoniously tuned, which when struck give notes of much purity and tone, comparable only to church bells of very high quality. They are not equal in carrying power to that of heavy bells, but in quiet districts, the bells of No. 3 calibre have been heard a distance of four miles. Their cost is only a fraction of the price of ordinary church bells; they vibrate when struck by hammers actuated by cords in a frame played by one man or by mechanism or electricity. Those of No. 1 size are clearly audible at a mile distance, of which 8 bells cost £100; 10 bells £120; 13 bells £150. These have been set up at S. Alban's church, Copenhagen; Parkstone, Dorset; Swinton, Yorkshire; West Anstey, Dulverton; Worthing, Sussex; Taunton; Alfreton; Kingswood, Wotton-under-Edge; Holland, Bodmin; S. Mary's collegiate church, Port Elizabeth; Kirton, Ollerton, Newark; S. Mary Magdalene, Brighton; and other places. A peal of eight bells is supplied for £75, fixed complete ready for ringing. These chimes are also arranged for domestic use, clocks, halls, etc.

TUBULAR DRAIN PIPE. A letter from John Roe relates the experiments made by him for Edwin Chadwick during 1843-5 in cement, and the first glazed stoneware pipes were made and delivered Sept. 9, 1845, at the Holborn and Finsbury office of Sewers; *BUILDER Journal*, 2 May 1885. **BAZALGETTE, Failures in Tubular Pipe Sewers**; report to the Metropolitan Commissioners of Sewers; *CIVIL ENGINEER, ETC., Journal*, 1853, xvi, 384, pl. 30-1. **PIPE.** **PIPE DRAIN.** **STONE-WARE.**

TUBULAR FOUNDATION. See **CYLINDER** as applied in foundations. The vacuum or Pott's method; the compressed air or Triger's system; also described in *BUILDING NEWS Journal*, 1870, xviii, 297.

TUBULAR GIRDER BRIDGE. One in which the requisite strength and rigidity are obtained by disposing the materials in the form of a horizontal tube, through which is the passage for traffic. It is a highly important invention, admirably adapted for spanning wide spaces, and affording all required strength with a positive minimum of depth. It is in this work only requisite to refer to this invention as connected with the **TUBULAR BEAM** or **girder**, or **BOX BEAM**, now extensively used in building operations, as bressumers, in flooring for large spans, fire-proof floor-

ing, roofing, and other such operations. These bridges owe their origin to the manufacture of wrought plate iron, which was first used in shipbuilding. Great improvements were soon made in the mode of joining and rivetting these plates, and the **T**, **L**, and double **L** iron, or channel iron, manufactured by Fairbairn, led to the great works which were carried out after its application to railway purposes.

W. Fairbairn's patent, 1846, consists in a wrought iron rectangular tube having a head formed of two rectangular tubes side by side (*CIVIL ENGINEER, ETC., Journal*, 1847, x, 143, and other publications named below). The formulæ for strength by W. Fairbairn, and E. Hodgkinson, are given in *INSTITUTION OF CIVIL ENGINEERS, Proceedings*, 1850, ix, 235 and 251. Table of Particulars of tubular bridges for single track railways, the spans exceeding 300 ft., by T. C. Clarke, *idem*, 1878, liv, 194. The first application of this girder was for the Leeds and Liverpool canal on the Blackburn and Bolton railway, 66 ft. long with a span of 60 ft. (*idem*, p. 376-7). The landing stage at Liverpool 152 ft. 4 ins. long, 142 ft. clear span, by W. Cubitt. Over the river Medlock, 100 ft. by J. Hawkshaw. At Gainsborough over the river Trent, on Manchester, Sheffield, and Lincoln railway, two spans of 154 ft. each; it has a total length of 460 ft., including two elliptic arches of 50 ft. span each and a centre pier; the tubes are strengthened by an arched rib of a double **L** shape (**I**) one foot deep, by J. Fowler (*idem*, 1849, xii, 255). Torksey bridge over the river Trent (*idem*, 1852, xv, 8-14; and *INST. OF CIVIL ENGINEERS, Proceedings*, 1850, ix, 233-74). Near Walton station, over the Liverpool and Yorkshire railway, three tubular girders 13 ft. apart, 88 ft. span, 4 ft. high, fell from fracture in the middle; *BUILDER Journal*, 1859, xvii, 864. Small tubular or box girder bridge at Chalk Farm, and at Gateshead; CLARK, *Britannia, etc., Bridge*, fol., 1850, pl. 43 and 45. Aqueduct over railway at Grenoble, *ANNALES DE LA CONSTRUCTION*, fol., Paris, 1857, iii, 58.

The Britannia railway bridge is erected over the Menai straits, 1,492 ft. wide at neap-tides, 200 ft. above high-water mark, in four separate tubes of boiler-plates rivetted together. The Board of Admiralty had refused permission for a bridge of two arches each of 450 ft. span, to spring from 50 ft. and to be 100 ft. high in the centre. Robert Stephenson then proposed to the Chester and Holyhead railway company to build straight tubes across the Menai and Conway straits, of an oval form. Messrs. Fairbairn, prof. Eaton Hodgkinson, and Edwin Clark were associated in making experiments on a model one-sixth of the real size. Cylindrical and elliptic tubes failed; the rectangular form, contrary to theory appeared the most reliable. The strength of wrought-iron **BOILER-PLATES** was experimented upon in various ways. The result was a tubular girder of 274 ft. from the embankment on the Caernarvon shore to the low-water tower; another from the Anglesea shore: two of 472 ft. each from these towers to the Britannia tower in the centre of the strait, = 1,492 ft. total. *Report by STEPHENSON, in CIVIL ENGINEER, ETC., Journal*, 1846, ix, 83; strength 100-3; experiments 172; 298; model bridge, x, 31; *BUCHANAN, On Strength*, 1848, xi, 125, 153; elevation, xii, 218-20. *BUILDER Journal*, 1849, vii, *passim*; and viii, 433-4. *ILLUSTRATED LONDON NEWS*, 1849, Jan., xiv, 24-5, and June, 440-1; xv, 133, app. for lifting; 1850, xvi, 193, three cuts of completion, entrance and interior.

The Conway tubular bridge followed. This tube is 14 ft. 8 ins. wide and 27 ft. high, both outside dimensions; the inner part being 14 ft. by 21 ft. 6 ins.; the head consists of two rows of six small rectangular tubes, and the bottom of one row. *ALLGEMEINE BAUZEITUNG*, 1st Ser., 1849, pl. 273-4. *BRITISH ASSOCIATION at Southampton*, 1846, description in *CIVIL ENGINEER, ETC., Journal*, 1846, ix, 307; and xi, 161. *ILLUSTRATED LONDON NEWS*, 1848, xii, 170-2, nine cuts; xiii, 116, Conway and Bangor stations.

14.
FAIRBAIRN, *Account of the Britannia and Conway Tubular Bridges*, 8vo., 1849. CLARK, *Brit. and Conway Bridges; Beams and Properties of Materials used in Construction*, fol., 1850; and

CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 277-8. DEMPSEY, *Malleable Iron Tubular Bridges*, fol., 1850. WARR, *Dynamics*, 8vo., 1851, p. 195. TATE, *Strength of Materials applied to Tubular Bridges, etc.*, 8vo., 1850. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, xi, 152; xiv *passim*. ILLUSTRATED LONDON NEWS, 1849, xiv, 24; 440; xv, 133; xvi, 193. ROYAL INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1855-56, p. 135.

FAIRBAIRN, *Application of Iron*, 8vo., 1854, p. 255; and 3rd edit., 1864. URE, *Dictionary of Arts, etc.*, 4th edit., i, 668. HANN AND HOSKING, *Bridges*, 8vo. (Weale), 1843-50; Supp., pl. 5-7. WARR, *Dynamics*, 8vo., 1851, p. 182-3.

The Victoria bridge at Montreal is a tubular girder of 25 spans, the centre one 330 ft., and the others 242 ft. each. *BUILDER Journal*, 1854, xii, 550; xiv, 78.

TUBULAR SUSPENSION BRIDGE by diagonal chains, across the river Wye for the South Wales railway; four spans, one of 300 ft. with three of 100 ft. each; 150 ft. above low-water; by I. K. Brunel; CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 176. The Albert bridge at Saltash, near Plymouth, 2,240 ft. long, with two spans of 455 ft. each, was opened in May 1859.

TUBULAR RIB. The Carrousel bridge at Paris was completed in 1836, with three arches, one of 187 ft. and two of 156 ft. each; the principle of construction is a timber arc on the laminated principle cased in cast iron, the transverse section being elliptic, cast in twenty-two lengths, and from its shape has been called the "tubular rib"; Polonceau was the engineer; CIVIL ENGINEER, ETC., *Journal*, 1842, v, 227, 334.

TUBULAR ROOF. Iron rafter formed with a tube carrying pipes laid close together horizontally on which is the covering. "Couvertures économiques à voligeage en roseaux du midi, reliés par des fils en fers, système Lagout", chemin de fer du Midi; in *Annales de la Construction*, 1857, pl. 46.

TUCKED. A term used 1888 in forming a new roof with parapet; "After the gutters are laid with 6 lbs. lead flash the parapets with 5 lbs. lead tucked in one inch wedged and pointed." R. R. R.

TUCK POINTING; or tuck and pat pointing (Fr. *joint dit Anglais, saillant*; *BUILDER Journal*, 1861, xix, 402). After the common mortar is scraped, or as technically termed, raked out of all the joints, and the front is washed and coloured down, fine mortar called stopping mortar, is put in, tinged of a brown, yellow, or bluish tint, by a mixture of ochre, or of coal ashes, and lamp-black. This mortar is well worked up, and a small groove formed in the centre of it, by a pointing-trowel. When set, fine white lime putty is worked on by a smaller pointing-trowel, and while still wet, the edges are cut off by a "pointing knife", along a straight-edge rule, leaving a parallel line about a quarter to one-eighth of an inch thick, the superfluous putty being scraped off at the same time. It is common to make the vertical lines called "perpens" somewhat narrower than the horizontal ones. This work gives to an old front the appearance of a new building. "All the external joints of walls built with chalk lime mortar with cement, or with some superior kind of lime, should be pointed as soon as it shall become necessary; which may not be the case until some years after the building is finished. I apprehend it should not be done from the first—because mortar made of chalk lime—is compressible"; PASLEY, *Limes, etc.*, 8vo., London, 1838, § 12, 13, 20. FLOATING. POINTING.

"Tuck and pat courses—when after all that the best brick-layer can do, it has ill-effect, and looks as if the mortar had no union with the bricks and was forced from them. Neither is it so strong or so beautiful as when worked in thin courses jointed in the common manner, as all the rubbed red stock fronts, etc., are done, of his grace the duke of Marlborough's house in St. James's park, built by that great architect sir Christopher Wren, which would have cost double the money had the courses been worked tuck and pat"; LANGLEY, *London Prices*, 8vo., 1750, p. 100.

BASTARD TUCK POINTING is work in which only the brick and ARCH. PUB. SOC.

white lime-line show, as the mortar-joint is lost in the colouring of the brickwork, the stopping not being applied.

TUDE. The ancient name of TUI or TUY, in Spain.

TUDELA (Anc. Tutela). A city in the province of Navarre, in Spain, situated at the confluence of the rivers Ebro and Queyles. Over the former river is a stone bridge built 980-994, having 17 arches of different styles, crossing the river at a considerable angle, and is nearly a quarter of a mile long. In one of the squares are held the bull-fights; and in another is the market-place which has arcades all round. There are six fountains. The bishopric was founded 1783, and suppressed in 1851. The *colegiata* or cathedral dedicated to, commenced 1135, consecrated 1188, is one of the great churches of northern Spain; the chancel has a polygonal apse, the stalls of the *coro* are in the nave; a large rose-window in the west front and a rich doorway; the cloisters to the south have forty arches. Of the four parish churches, that of la Magdalena has a good west portal and a waggon-roof. There is a small theatre; an orphan asylum and foundling hospital in a Dominican monastery; and many nunneries and monasteries turned to secular uses. Lope Soria was 1419 master of the works here to king Carlos II d'Evreux. STREET, *Gothic Architecture in Spain*, 8vo., 1865, p. 395. 28. 50. 96.

TUDELILLA. A native of Tarragona; studied in Italy; and settling at Zaragoza was employed 1526-28 on the trascoro in the cathedral of La Seu, erecting twelve columns, canopies, and colossal statues. In 1536 he carried out the cloisters of the church of Sta. Engracia. His works as a stuccoist have decayed. He became blind, and died in 1566. 66. 68.

TUDOR ARCH. An obtuse-shaped arch formed from four centres varying according to the height of the apex above the springing. Numerous rules are given to strike or draw such an arch, in works on masonry and brickwork. Amongst the later suggestions is one given in CIVIL ENGINEER, ETC., *Journal*, 1839, ii, 98. Other methods from points, in *BUILDER Journal*, 1844, ii, 273, 304; and 532, 557, 585, by J. JOPLING, showing by fine lines laid on an outline from Croydon palace, how the present common mode of drawing such arches is imperfect. 1. 19.

TUDOR ARCHITECTURE, or STYLE. A development of mediæval art, being the name given to the continuation of the PERPENDICULAR Gothic architecture in Great Britain. The name is derived from the line of sovereigns who reigned during its prevalence, including Henrys VII and VIII, Edward VI, Mary and Elizabeth, or from 1485 to 1603, but this article comprises only the reign of Henry VII (1485-1509); the later portion of the above dates being already treated under ELIZABETHAN ARCHITECTURE; this reign includes the earliest introduction of the ITALIAN STYLE in England. LATE POINTED ARCHITECTURE.

"Of his building also was Richmond (or Shene) palace, and that most beautiful piece—the chapel at Westminster [1503]—which forms of more curious and exquisite building he and bishop Fox [Richard, 1487-1528] first (as is reported) learned in France, and thence brought with them into England"; SPEED, *History of Great Britaine*, fol., 1611, p. 751; 1632, p. 979; 1650, p. 995.

1486 Rood loft, Merton college, Oxford.

1488 S. Mary's church, Oxford, nave and aisles.

1490 Bishop Alcock's chapel, and bishop's palace, Ely.

1490-1507 Angel steeple, Canterbury cathedral.

1490-1547 Tower, etc., Leake church, near Boston.

1492-1505 Tower, Magdalen college, Oxford.

1496 Chapel of the Assumption south side of library (had two floors), Hereford cathedral, by bishop Audley.

1499-1616 Bath Abbey church, Somersetshire.

1500-50 Eton college, Buckinghamshire.

1501-15 Louth church steeple, Lincolnshire.

1502-24 Chapel of the Assumption, Salisbury cathedral, for bishop Audley's tomb.

1505 The former Savoy palace, London.

1507-20 Groined roof of choir, S. George's chapel, Windsor.

1507 S. Nicholas church, Aberdeen, 24 stalls.

1508-11 Vaulting of King's college chapel, Cambridge.

The mausions usually consisted of an inner and base court between which stood the gate-house. The principal apartments

were the great chamber, the hall, chapel, gallery on an upper storey running the whole length of one side of the quadrangle, and the summer and winter parlours. Domestic buildings of this reign are:—

| | |
|--|--|
| 1180 Hall of Eltham palace, Kent. | 1500-25 Loyer Marney hall, Essex. |
| 1482 Oxburgh hall, Norfolk. | 1500-50 Eton college, Buckinghamshire. |
| 1487 Smithills hall, near Bolton. | |
| 1490 <i>cir.</i> East side of quadrangle, Linalthgow palace. | 1500 <i>cir.</i> Wolterton manor house, East Barsham, Norfolk. |
| 1490 Astley hall, near Chorley, Lancashire. | 1501 Southam house, near Cheltenham, Gloucestershire. |
| 1490 Parham park, Sussex. | 1504 S. John's gate, Clerkenwell. |
| 1490 Gatehouse of Thornbury college, Gloucestershire. | 1506 Bond's hospital, and Bablake school, Coventry. |
| 1494 King's college, Aberdeen. | 1509 Grey Friars or Ford's hospital, Coventry. |
| 1500 <i>cir.</i> Irnham hall, Lincolnshire. | |

Lincoln's Inn hall, designed 1848 by P. Hardwick, R.A., is a good modern example.

Tombs.—1484 Ralph Nevill, earl of Westmoreland, and wife in Brancepeth church, Durham. 1488 canopied tomb, William earl of Arundel and wife, at Arundel, Sussex. 1499 Edward Stafford, lord Wiltshire, Lowick church, Northumberland. 1502-4 Arthur, prince of Wales, Worcester cathedral. George, fourth earl of Shrewsbury, and his wives Ann and Elizabeth, Sheffield parish church.

Publications.—1485 L. B. Alberti, *Architettura*, fol., Florence. 1486 Vitruvius, *Architettura*, fol., Rome; 1496, 2nd edit. 1499 F. Colonna, *Poliphili Hypermotomachia*, 4to., Venice. *Cir.* 1495 and 1502 are the dates of the two edifices in Rome, by Bramante Lazzari.

Artists and others.—1484 Thomas Daniel, supervisor of the king's works. 1499 Edward Leicestre at Bath abbey church. 1506 Pietro Torregiano may have arrived in England; James Hales, assistant. 1508-11 John Wastell, master-mason; Henry Semerk, warden, at vaulting of King's college chapel, Cambridge. 1505 Thomas Hyndeley, master mason at York cathedral. Thomas Hunt, clerk and overseer of works in England. 1507 J. Ferdour, stalls in S. Nicholas church, Aberdeen. 1507-20 J. Hylmer and W. Vertue, freemasons, vaulting to choir in S. George's chapel, Windsor.

HUNT, *Tudor Architecture*, 4to., 1830. LAMB, *Studies of Ancient Domestic Architecture*, 4to., 1846, selection from Grimm's Drawings in Brit. Mus., Add. MS. 15,537. PAPWORTH, *Renaissance and Italian Styles in Great Britain*, etc., 8vo., 1883. ROBINSON, *Domestic Architecture in the Tudor Style*, 4to., 1837. The works by A. W. PUGIN. BURY, *Woodwork*, 4to., n. d.

TUDOR FLOWER. A flat flower or leaf of a diamond shape, placed upright on its stalk, much used in the crestings of late Pointed work. The red rose was the Tudor badge of the house of Lancaster.

TUDOR GROIN. See GROIN; four centred.

TUDOR PATTERN. In the early part of the Tudor period, the lower portion of the walls of the chief apartments were wainscotted, and the upper portion often merely plastered; this latter was then covered with hangings of tapestry work. The panels of the wainscoting were often enriched with carving, of varied patterns, including initials, mottoes, crests, and badges; TURNER and PARKER, *Domestic Arch.*, 8vo., 1859, iii, 107-9, gives several examples; those in the screen at Sefton church, *cir.* 1535-55, are also good. In the time of Henry VIII the most common pattern was the LINEN PATTERN.

TUE; Tuyc; Tue iron. See TEWEL and TUYERE.

TUELLUM. The term translated FLUE used in the Liberate Roll, 23rd king Henry III, 10 Sept.; in that of 24th, Feb. 24, "tuellus" is translated "drain": 13 Dec., 36th, also flue; TURNER and PARKER, *Dom. Architecture*, 8vo., 1851, i, 192, 194, 235, and perhaps others not marked therein. TUN.

TUF; TUFFA; TOPH STONE (Fr. *tuf lithoide*; *tuf granulaire*). Volcanic materials consolidated. POZZUOLANO is a sort of powdered pumice. LAVA. It is similar to calc-sinter in its formation, being filtered water highly impregnated with lime.

Its colour is of a dull grey; it is porous, cellular, soft, and filled with foreign matter. It is also found hard and fitted for all the purposes of the builder. The town of Pasti, in Italy, is built with a description of a hard and durable tufa. Herculaneum was submerged by liquid molten lava now quarried as tufa; Pompeii was covered with sand and ashes from Vesuvius, now partially consolidated into tufa. The opus quadratum in early times was always made of volcanic tufa, which forms the various hills on which Rome stands. It is a soft brown stone composed of volcanic matter concreted together by heat, age, and pressure; it could be quarried almost anywhere in Rome, and was easily cut by the bronze tools. Examples of one of these prehistoric walls exist at several places round the Palatine hill, the so-called wall of Romulus—about 10 ft. thick, built of squared blocks of tufa, varying in length, but roughly 2 Roman feet thick and averaging 21 inches across the end. The use of the PEPERINO followed; MIDDLETON, *Chief Methods of Construction*, etc., in *ARCHÆOLOGIA*, 4to., 1888, pt. i, 42. PARKER, *Walls of Rome*, 8vo., 1874, iii. LETARQUILLY, *Rome Moderne*, 4to., Paris, 1840-5, p. 67. The buildings at Pompeii appear to have been constructed with a volcanic TUFFA; BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 53. SARACINESCA CONSTRUCTIO, used in very earliest period; and revived for facing a wall with tufa from ix to xv cent. URGUB.

A light porous stone, found in England, and formerly used for filling up the spaces between the ribs in mediæval vaulting, as at Worcester cathedral. It is for the first time mentioned as follows: "ibi celum ligneum egregiâ picturâ decoratum, hic fornix ex lapidum et tufa levi decenter composita est"; by William of Sens at Canterbury cathedral; GERVASIUS. Shelsley Walsh church, Worcestershire, built entirely of "travertine", a sort of tufa obtained at Shenstone Rock, close to the church; it is like sponge: the church whilst plastered over inside and out, was wringing wet, and the surface could be scraped with the finger-nail; one summer after the plaster was removed, the work was dry and quite hard; as described by G. Truefitt, F.S.A., who restored the church in 1859. A quarry of toph stone at Dresleie (or Dursley), Gloucestershire; HOLINSHED, *Description of England*, fol., 1586, i, 235. PARKER states that Gundulph's crypt at Rochester cathedral "is low, the vault is groined without ribs, built of rough tufa and plastered; the detached pillars are monoliths of the stone of the country: the responds are not monoliths, but of small tufa stones, one which in subsequent times was only used for the vaulting"; *ARCHÆOLOGICAL INSTITUTE*; given in *BUILDER Journal*, 1863, xxi, 564.

At the old church at Ditton, Surrey (?), an arch was found 1860, formed of tufphos or tufpha stone, the same as that of which a considerable portion of the ancient Pharos at Dover castle was built.

"The vaulting was composed either of small stones let into a bed of mortar, or of tufa, or of a light calcareous stone which is found in many parts of Normandy; KNIGHT, *Architectural Tour*, 8vo., 1836, p. 200. In France, the town, and particularly the church of S. Michael le Puy, are built of a basaltic tufa, the quarries of which are on Mont Anis. The ruins of the great château de Polignac are entirely of a brown tufa spotted with black. The quarries of S. Adrien, between Valrosse and Deziers, furnish freestones, which are used in building bakers' ovens, bridges, etc. This tufa is yellow spotted with black."

It is the material of the church 1067-74 of SS. George and James at Cologne, except the square western tower, which is of grey grit-stone, built at the period of the vaulting, namely XII century; WEALE, *Belgium*, p. 440. The manufacture of objects obtained from the deposits of the hot-water springs at Carlsbad, is a great industry of the town. 19. 25.

TUFFNEL (JOHN), 1673 appointed mason to Westminster abbey, and died 18 Feb. 1696-7, aged 53, after 23 years' service; DART, *Westm. Abbey*, fol., 1742.

TUFFNELL (capt. EDWARD), 1697 was mason or "architect" to Westminster abbey, qui latera hujusce Augustissime Ædis

australe et orientale magnâ ex parte refecit et exornavit, etc., *ib.* 2nd Sept. 1719, *et.* 41, as on his monument in the south ambulatory of the cloisters:—having served twenty-two years. NEALE, *Westminster Abbey*, 4to., 1818-23, ii, 289.

TUFFNELL (capt. ...), was January 1737 appointed master-mason to the abbey church, Westminster, in room of ... Horse-nail or Horsnall, who resigned; GENTLEMAN'S MAGAZINE, 1737, vii, 61.

TUFO (Lat. *tophus*, VITRUVIUS, ii, 6). Earth, which is sand of various grains slightly petrified; somewhat like oolite, without volcanic character (COSTA e CARDINALI), *Dizionario della lingua Italiana*, 7 vols., 4to., Bologna, 1819-26. The red and black sand of Campania. A volcanic stone, being a coarse material, but very durable, and more easily worked than the finer and compact peperino; ARCHÆOLOGIA, 1867, xli, 190. TRAVERTINE is a sort of tufo. *Nesfro* is a volcanic rock, a species of tufo, distinguished from the ordinary red or yellow sorts of the Campagna by its colour, which is a dark grey, and by its superior hardness and compactness, a difference said to be owing to its having cooled more slowly and uninterruptedly; ABEKEN, *Mittelitalien*, p. 16; DENNIS, *Etruria*, 1848, i, 5. There are two horses' heads found at Vulci, of this material, in the Museo Gregoriano, in the Vatican; and a sarcophagus from Tarquinium. The walls of the new Protestant church at Naples, erected 1863, are built of different-coloured *tufos* from Sorrento, red, grey, brown, and stone-colour tints; white Malta stone is used for the dressings. Care is necessary in selecting those which will stand the external sea air, for those at Naples, having a large proportion of oxide of iron, crumble away with the least wind. The quality in each quarry varies in proportion to the depth of the excavation. The upper portions are light, friable, and contain more pumice; while the lower stratum which has undergone pressure is compact and of a darker colour; below the sea-level it is nearly black. Tufo is very cheap, and easily worked with a hatchet; and is set with a very close joint in regular courses; BUILDER *Journal*, 1863, xxi, 756.

TUGAL-CARIST. In 1640 he was architect at Rennes cathedral, and probably designed the tower surmounting the façade, completed 1646. BOURASSÉ, *Cath. de France*.

TUGURIUM. A Latin term used 950-1000 for a hut or cottage, in the treatise of Lantfred, monk of Winchester; the dwelling of a smith had an old roof or thatch, "Sanctus vates—tugurium obsoleti deserens tegetis"; MS. Reg. 15 c. 7, fol. 7b, quoted in TURNER, *Dom. Architecture*, 8vo., 1851, i, x.

TUI. See TUY, in Galicia, in Spain.

TULIP; see LOTUS (p. 141).

TULIPHURDUM. See VERDEN, in Hanover.

TULIP TREE. See LIRIODENDRON. Tulip-wood (Fr. *bois de rose*). A hard variegated wood, of red, black, and dark-brown veins, more pleasing than rose-wood, used chiefly for cabinet work.

TULLAMORE MARBLE. A quarry of dark-blue marble, in King's county, forty-six miles from Dublin, said to resist the action of the external atmosphere. The ninety heads to the castle chapel at Dublin, designed 1807-14 by F. Johnston, are of this material. There are several varieties of very excellent limestone; it has been used in many mansions for miles around. Some varieties have a pleasing appearance when polished, the colour being grey or dove-colour; others have darker portions disseminated, which give a peculiar clouded effect, and this variety is frequently preferred for polished work. It is chiefly used for chimney-pieces. Blocks of limestone of large dimensions can be obtained. WILKINSON, *Geology, etc., of Architecture*, 8vo., 1845, p. 232.

TULLUM or TULLO. The ancient name of TOUL, in France.

TULLY or Tulley or Toly (ROBERT). A monk of Gloucester abbey, to whom abbot Sebroke left *ex onere* the completion of the tower after his death in 1457; and who perhaps also carried out the lady chapel 1457-98. He 1460 became bishop of S. David's. In 1473 he laid the foundation stone of Magdalen college,

Oxford, founded by William of Waynflete, bishop of Winchester (W. Orchyerde, master mason); and died 1481; or 1484 and buried at Tenby. FOSBROKE, *Gloucester*, fol., 1819, p. 122 note.

DALLAWAY, *Discourses*, 8vo., 1833, p. 178.

TULTEQUE and Toltec. See TOULTEC ARCHITECTURE.

TUMBLING-IN. The same as TRIMMING-IN.

TUMBOS. One of the Greek terms for a mound of earth or stone. TOMB. TUMULUS.

TUMMALS. A term used in mining for a great quantity or heap.

TUMULUS (Gr. *tumbos*; Fr. *tombelle*; *galgal*). A mound of earth, or barrow. The earliest form of sepulchral memorial. CAIRN. BARROW. SEMA. TOMB. The usual finish in early times to a tomb of any great man. Such is that ordered by Achilles to be placed over the ashes of Patroclus (*Il.*, V, 126) and of Hector; and such the places haunted by the earthly Hecate (*Theocrit.*, 2, 13). SUIDAS, s. v., simply calls them "monuments in the earth", *ἐν τῇ γῇ μνημεῖα*, but afterwards mentions one built up of dried turf. These mounds are found in many parts of the globe. "The circular works of the Danes and Saxons so frequent in England, in connection with the pentagon or doom-ring of Denmark, stretching in a continuous line from Brownsville in Pennsylvania, through Wisconsin, Canada, Greenland, and Iceland to Sweden direct, are conceived to be strong evidence of the migration of the Danes, Belgians, or Saxons, at some unknown era in time. No corresponding earth-works are found south of Pennsylvania"; PIDGEON, *Traditions of De-coo-dah, etc.*, 8vo., 1853. SQUIER AND DAVIS, *Ancient Monuments of the Mississippi Valley*, in *Smithsonian Contributions to Knowledge*, 4to., Washington, 1848, i. BUILDER *Journal*, 1849, vii, 490. Tumuli consist of (a) barrows of earth only; (b) with small stone chambers or cists; (c) with megalithic chambers or dolmens; (d) with external access to chambers. The great pyramid of Gizeh was erected certainly as early as 3000 years before Christ, yet it must be a lineal descendant of a rude-chambered tumulus or cairn, with external access to the chambers, and it seems difficult to estimate how many thousands of years it must have required before such rude sepulchres as those our ancestors erected, could have been elaborated into such perfect and gigantic specimens of masonry—as the pyramids. Outside Egypt the oldest tumulus we know of, with an absolutely authentic date, is that which Alyattes, the father of CROESUS, king of Lydia, erected for his own resting-place before 561 B.C.; it is described by HERODOTUS, i, 93, and has been explored by Dr. OLFFERS, *Lydische Königsgräber*, Berlin, 1859; it is 1,180 ft. diameter and 200 ft. high. The tumulus at Tantalais, tomb of Atreus at Mycenæ, of Cocumella at Vulci, 240 ft. diam., and later works, are given in FERGUSON, *Rude Stone Monuments*, 8vo., 1872, p. 29. TOPE. MAUSOLEUM.

There are about thirteen different sorts of barrows described by sir R. C. HOARE, *Ancient Wiltshire*, fol., 1810, 1821. The Bartlow hills, Essex, consist of four tumuli in a row and varying in size, the largest being 142 ft. diameter and 44 ft. high, explored 1835 by J. G. Rokewood, who found in it a gallery 56 ft. long, ending in a cist containing Roman or Brito-Roman relics; ARCHÆOLOGIA, xxvii. FERGUSON dates them as probably of the time of Hadrian. Crook barrow hill, Worcestershire, accounted the largest barrow in England. Silbury hill, near Marlborough, Wiltshire, one of the largest in the world; about 600 ft. diameter and 130 ft. high. WARNE, *Celtic Tumuli of Dorset, Sepulchral Mounds of the Durobriges*, 13 pl., fol., 1866. New Grange, Drogheda, Ireland, was explored 1770; it is about 400 ft. diam. and 70 ft. high; the base was encircled by unhewn upright stones, of which ten remained, from 7 to 9 ft. above ground; one stood on the summit; within it was found a gallery of upright stones opening into a sepulchral chamber with a domical top; ARCHÆOLOGIA, ii. also a gold coin of the emperor Valentinian.

At PANTICAPÆUM and around Kertch are an immense number varying from 3 ft. to 100 ft. diameter, and from 5 ft. to 150 ft. high; they are mentioned by HERODOTUS; and since 1824 from

them have been obtained specimens of the highest Hellenic art, now deposited in the museum at S. Petersburg. A mound which still exists near the site of Acanthus (now Erisso), was raised by the army of Xerxes, in memory of a noble Persian who had superintended the construction of the canal cut across the isthmus of Athos. Tumulus of Tantalus, near Smyrna, ravaged by TEXIER; *ATHENÆUM Journal*, 1870, January, p. 64. *Modrassch* or Medrecen, the tomb of the Numidian kings, near Therveste, in Tunisia, is 193 ft. diam. and 60 ft. high. That to a Christian lady, near Kolea, in Algeria, 200 ft. diam., is described by LEWIS, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1868-69, p. 62. At Maltape, near Pergamus, plan, etc., by Dr. Phené; *BUILDER Journal*, xxxiii, 1877, p. 608. Tumulus or *mayhila*, in POTOCKI, *Astrakhan*, 8vo., Paris, 1829, p. 2, 7, 172. In Tartary, BELL, *Travels to parts of Asia*, 12mo., 1764, i, 181. *Memo. on the Memorials of Antiquity in the Coimbatore District*, by W. Fraser, C.E., dated 21 Dec. 1859, reprinted in *ATHENÆUM Journal*, 1860, Sept. 8, p. 324-5.

AKERMAN, *Archæological Index*, 8vo., 1847. LUEBOCK, *Our Ancient Monuments*, 4to., 1880. GAILHABAUD, *Monuments*, 4to., Paris, 1850, i, pl. 6, gives several. AINSWORTH, *Mounds (Tells) of North Syria*, in *LITERARY GAZETTE*, No. 1928, p. 1267: the coast tombs assimilate to the Greek; those inland, as at Sardis, are quite Asian in design. That of Tantalus is small compared with those of Cræsus and his line of kings. WARING, *Stone Monuments, Tumuli, etc.*, 4to., 1870. NADAILLAC (Du Pouget), *Amérique préhistorique*, 8vo., Paris, 1883; translation by D'ANVERS, 8vo., 1885, chap. iii, "the Mound Builders": also *Mœurs et Monuments des Peuples préhistoriques*, 8vo., Paris, 1888.

TUN (Sax. tunne). A measure of capacity; or 252 gallons: as TON is a measure of weight, 20 cwt., or 2,240 pounds. A ton or tun of timber is 40 solid feet.

TUN (Fr. tonnelle). The term given early to an enclosed passage, FUNNEL or TUNNEL, or chimney, later called a FLUE, conveying smoke. SHANK. TUELLUM. 1463, "newe hous with the iij tunys of chemeneyis"; CAMDEN SOCIETY, *Bury Wills*, 1851, p. 241; and TURNER AND PARKER, *Domestic Architecture*, 8vo., 1859, iii, 37. It may also have been given to the shaft of a chimney, as "tunnell" or chimney top, is used by John Thorpe in one of his drawings; No. 13 in WALPOLE, *Anecdotes*, edit. 1862, p. 200. "Tunnel of any chimney"; MOXON, *Mechanick Exercises* (Carpentry), 4to., 1694, p. 141; 1666, in SEYMOUR, *London, etc.*, fol., 1734-5, i, 461. 1610-13, "Tun stone, tun stuff, tunnel stone, tunnel stone", for chimney shafts, at Wadham college; *ARCHÆOLOGICAL JOURNAL*, 8vo., 1849, viii, 390.

TUNBRIDGE STONE; see CALVERLEY STONE; and HUTCHINSON'S PATENT.

TUNG YANG FOO. A city in the province of Gankwuy, in the north of China, where Hung-woo the founder of the Ming dynasty was born, and who drove out the Mongols or Tatars. He marked off the space of nine leagues for the compass of the city, built and endowed splendid Buddhist monasteries, and erected a grand monument to his father; he was obliged to reside at Nankin, and these monuments have since fallen into decay. 72.

TUNIS. The capital of the regency of the same name, in North Africa, situated at the west end of a large oval lagoon, or lake of Tunis, which at the other end emerges at Goletta by a narrow strait or canal into the bay of Tunis. The vessels were built 705 in the arsenals of Tunis with which Sicily was conquered; OKLEY, *History of the Saracens*, 8vo., 1843, p. 500. It was taken and sacked 1160 by Abdelmumen; CONDE, *Arabs in Spain*, 8vo., 1854, ii, 490; and in 1206 became independent of the caliph of Bagdad. It was taken by the French in 1881. Seven gates exist of the destroyed walls; few of the old buildings remain; but there are several fine mosques, one with columns and marbles brought from the interior; the large djamâa ez Zeitouna, founded 698, built *cir.* 1230, has cloisters; djamâa el Kasba, built 1232 by Abu Zakariya; djamâa Sidi

Mahrez has a large dome and smaller ones around; a mosque is stated to have been designed and erected about 1465 by Adam Kraft of Nuremberg; and one in the street leading to the Babalouk suburb by A. C. d'Aviler 1674-6 while a prisoner. Several public baths; and extensive native bazaars, are the chief attraction. Each of the native houses surrounds a court, water is obtained by a cistern on the flat roof, and by an ancient aqueduct from Jebel Zaghlwan, repaired lately at a cost of about £500,000. The *dar el Bey*, the residence of the bey, is a handsome modern structure, to which are attached apartments of about 1750, gems of Moorish decoration (GRAHAM, p. 30). Several barracks, one capable of accommodating 4,000 men. Near the old Marine gate have been erected the French residency, an hotel, Roman Catholic provisional cathedral, banks and public offices, blocks of houses, fine market-place. There is also an English church of iron, with several colleges.

The ruins of CARTHAGE are northwards about three miles distant. At some distance is the Bardo palace, a small town of itself, remarkable for the lion court (GRAHAM, 32) and apartments in Moorish style. CHASSIRON, *Aperçu historique pittoresque de la Régence de Tunis*, fol., 1849. TEMPLE, *Excursions in the Méditerranéenne*, 8vo., 1835. TARDIEU, *Voyage Archéologique en Italie et en Tunisie*, 4to., 1885. TRÉMAUX, *Parallèles des édifices anciens et modernes*, Paris, 1858. SHAW, *Travels*, fol., 1757. EWALD, *Reise von Tunis nach Tripolis*. A. GRAHAM AND ASHBEE, *Travels in Tunisia*, 8vo., 1887, which gives a bibliography. GRAHAM, in *ROY. INST. OF BRIT. ARCHTS., Transactions*, 1886, p. 153-61. R. L. PLAYFAIR, *Travels in Footsteps of Bruce*, 4to., 1877; and read by DONALDSON, *idem, Sessional Papers*, 1876. BESWILLWALD, after the survey in 1882 and 1884, report dated Paris, 20 May 1885; DALY, *Revue Générale*, 4to., 1886, p. 131; and R. I. B. A. *Journal*, 6 Jan. 1887. v. GUÉRIN, *Voy. Archéol. dans la Régence*, 8vo., 1862. SALADIN, *Antiquités de la Régence—antig. antérieurs à la conquête Arabe*, 8vo., 1886. 14. 28. 50.

TUNNEL (It. *traforo*; Sp. *mina*; Fr. *tunnel*; Ger. *tunnel*). A subterranean gallery or passage, more or less horizontal, driven through an elevation or hill, or under a river, for a canal, road, or railway; occasionally for persons on foot only. It has also to be made in all mining operations for working in, as in obtaining coal, metals, etc. Formerly the rock or soil was entirely got out by hard manual labour, but of late years various boring machines have been invented for this purpose. After "boring" and "trial shafts" have been made, work is commenced by sinking "working shafts" sufficiently capacious to admit readily of lowering men and materials, raising the excavated material, fixing pumps, and for starting the heading of the intended tunnel. "Air shafts" are sunk for the purpose of effecting ventilation in the works below. If water prevails in the strata, this may be collected and drained off by an "adit", "heading", "gullet", or "driftway", set out with a sufficient slope. The Saltwood and Bletchingley tunnels were each 24 ft. wide at the broadest part, 30 ft. including the walls; 25 ft. high in the clear, 30 ft. including top arch and culvert. The top arch and walls were from two-and-a-half bricks to four bricks and the invert three bricks thick; the Shakespeare tunnel near Dover is formed in two bores or double, each 12 ft. wide, 19 ft. high to springing and 30 ft. extreme height, the pier between is 10 feet of solid chalk. The Kilsby tunnel passed through quicksand; those on the North Western railway are 24 ft. wide, 27 ft. 4 ins. high from the invert to the crown, and 24 ft. 4 ins. from the top of the rails to the crown. The Box tunnel is 30 ft. wide and 25 ft. high above the rails. A prepared list of the larger tunnels has been necessarily withdrawn for want of space.

Tunnelling in Towns. In constructing the railway from Paris to Vincennes in 1857, the engineer Bassompierre-Sewerin adopted a new method of avoiding the removal of a building under which it was to pass. The tunnel was built in successive circles or sections beginning with those intended to support the angles and bearing portions of the building, and then connecting

them by digging out the soil and forming the tunnel, as explained in *BUILDING NEWS Journal*, 1857, iii, 1119. The Metropolitan tunnels constructed under sir John Fowler, are described *s. v.* Railway, in *ENCYCLOPEDIA BRITANNICA*, 1887, 9th edit.

Publications on Railway Construction. INSTITUTION OF CIVIL ENGINEERS, Subject Catalogue. CRESY, *Encyc. of Civil Engineering*, 8vo., 1861. BRES, *Glossary*, 8vo., 1853. SIMMS, *Practical Tunnelling*; setting out of the Works, Shaft-sinking, Heading, Driving, Ranging the Lines, and Levelling under ground, Brickwork of tunnels, etc., 4to, 1844; revised with additions, S. Gothard and Mont Cenis, by D. K. Clark, 3rd edit., 1877. FONTENAY, *On Tunnels and Prices in England and France*, 8vo., 1847. McMASTER, *Bridge and Tunnel Centres*, 12mo., New York, 1875. SIMMS, *Public Works of Great Britain*, fol., 1838, pl. 45, 47, etc., 59. PENISTON, *On the Casualties of Tunnelling, with examples*, at INST. OF CIVIL ENGINEERS, *Proceedings*, 1854, xiii, 475-8. *Setting out Curved Tunnels*, in *BUILDER Journal*, 1859, xvii, 349. *Formation of a Tunnel*, in *ALLGEMEINE BAUZEITUNG*, 1839, pl. 280. DODD, *Reports, etc., of proposed Dry Tunnel from Gravesend to Tilbury*, 4to., 1798, and CLARKE, *Observations on same*, 4to., 1799.

ASTEL. POLING-BOARD. SHIELD. CULVERT. SHAFT. SUBTERRANEAN PASSAGE. SUBWAY. AQUEDUCT. EMISSARIUM.

TUNNEL or chimney shaft; see TUN.

TUNNEL SHAFT. J. H. W. BUCK, *The Construction of large Tunnel Shafts*, 8vo., 1880. McMASTER, *Bridge and Tunnel Centres*, 12mo., New York, 1875.

TUNTYGHT or tunnetight. In the Building Accounts of Eton college, 1447-8, stone is frequently paid for by the number of tonne tight; the Latin form also occurs of *dobitum*. Evidently the quantity which a large barrel contained, and the amount it weighed, were originally expressed by the same word *tun* or *ton*. "M' tonnetights of ragge hothe stones and flints ... ijs. iiij.; Cxvj. li. xiiij. iiij.;" WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., 1886, i, 389, 399; and Glossary, iii, 622. 1409-10, "Tunnetithe or tunthyte" of Dorwelle (Durwell) stone, for Mettingham college, Suffolk; *ARCHAEOLOGICAL JOURNAL*, 8vo., 1851, vi, 68. In BROWNE, *York Cathedral*, 4to., 1838-47, p. 222; and SURTEES SOCIETY, *Fabrick Rolls of York Cath.*, 8vo., 1859, p. 358, the term is also used. "Tight" is a corruption of tythe, meaning payment for a tun.

TURAGHAN. A disputed term among Irish antiquaries as applied to the ROUND TOWERS. (AGHADOE; ARDFERT.) The interior of the tower at Kilkenny was excavated in 1841, by Mr. Odell, the proprietor, and after piercing through floors of concrete and solid mason-work, two human skeletons were found at a depth of 14½ feet below the sill of the door. Similar remains have been found in Cloyne tower, also at Kilkenny; and an urn, with cremated bones, in Timahoe tower.

TURBA; see TARRES, in France.

TURBEH; see TOORBEH. The Turkish for tomb.

TURBINI (MARC ANTONIO), of Lugano, "architetto o pintosto capo maestro" at Brescia, where he designed the palazzi conte Soardi, sig. Luzzaghi, and conte Cesare Provaglio; the scala of the casa Fenaroli; the palazzo conte Lechi at Montirone; the parish church of Manerbio, and many other buildings. He died December 1756. 29.

TURBINI (abate GASPERO ANTONIO), born 16 December 1728, was a pupil of his father MARC ANTONIO, and the two almost rebuilt the city of Brescia. He joined the Jesuits in 1746, and was instructed by F. Sanvitale in painting and architecture. He wrote various treatises on baths, theatres, etc., and published *Elementi d'Architettura del F. Sanvitale*, 8vo., Brescia, 1765; with many small treatises 1766-68; and *Il palazzo pubblico Raynato*, 16 pl., fol., 1778. In Brescia, he designed the palazzo of the brothers A. and M. A. Ugioni; casa or palazzo Onofri a' Miracoli; palazzetto I. Fenaroli; casa G. Torriceni alla Grazie; palazzo B. Durini a' S. Croce; church and house of the Order of Malta; modernised the casa Covi at S. Giulia; with many tombs, tabernacles, and fittings for churches. His name

ARCH. PUB. SOC.

appears to each plate of ZAMBONI, *Memorie di Brescia*, fol., Brescia, 1776-78. Near the city, he designed the small but elegant sanctuary of the Virgin del Patrocinio sul colle di valle Tavarella.

He designed 1753 the vaulting of the new church of Gussago; with also an atrium after the antique, and other works: the parish church of Palosco, in Bergamo territory; modernised the church of S. Leonardo in Bergamo; designed the sanctuary of the Virgin della Neve, in Adrio; made a design for the parish church of Castiglione; church of Vobarno dello Salò; parish church of Montirone; casino for marchese di Toulon, minister of Spain at Venice; and a circular church, etc., for Lisbon; palazzo for conte G. Soardi alla Gavazza vicino agli Orzi nuovi; modernised the palazzo for C. J. Acerbio in Castelfrodo in Mantua; designed the palazzetto in Monticello d'ongina Parmegiano for A. G. Tredicini; modernised the palazzo of the Scotti a S. Jacopo, in Piacenza; additions to the gardens and other buildings at the palazzo conte Lechi at Montirone; the costly Filanda for marchese A. Archetti, with a church and gate, on Lago di Guarda; design for a large theatre at Milan 1777; and for S. Benedetto at Venice 1774; designed the church of Padernione, near Rodengo in Brescia; façade and atrio to the church of Volongo in Mantua; casa of sig. Verneschi alle Cà di Marco, near Fiesse; casino for conte G. Fenaroli at Coccaglio; garden and casino for sig. F. Averoldi at Gussago; collegio delle Dimesse at Quinzano; country house for G. Trussi at S. Zeno; casino for G. Udine at Betegno; large rustic *luogo* for conte Silla Martinengo agli Orzi nuovi; modernised with additions the palazzo of conte P. Provaglio at Monticelli d'Olio; and that of conte G. Luzzago at Manerbio; designed the country house of P. Giuseppe Quaranta Filippino at villa di Cogozzo in Valtrompia; made a design for a suburban palazzo for conte F. Martinengo at ponte della Mella; designed the grand palazzo with gardens, etc., for conte A. Gambara; and the parish church in Pralbrino. The date of his death is not stated; but probably soon after the account given in the *Serie degli Uomini i più Illustri*, 4to., Flor., 1776, xiii, 1375-87, from which the above has been condensed. 29.

TURBITH or Turpith mineral, or queen's yellow, obtained in 1700. A subsulphate of mercury, of a beautiful lemon yellow colour, but very liable to change by the action of light or impure air. It hardly deserves attention as a pigment.

TURBULA and Turba. The ancient names of TERUEL in Spain.

TURCHINECCHIO; GRECO. See GRECO.

TURCHINO ANTICO. A slatey grey marble with fine and shiny grains. Another with white stripes and waved with slatey blue. Piccolo Turchino antico has very fine grains and narrower stripes. Weighs 188 lbs. per foot cube. A modern marble is a bright bluish grey with bands of white or dark grey. It is found at Genoa.

TURENUM. The ancient name of TRANI, in Naples.

TURI (MARCO), in 1456 repaired the campanile of S. Michele arcangelo; CICOGLA, *Inscriz. Venet.*, iii; SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 230.

TURIANI, or TORRIANO (ORAZIO); see TOREIANI (H.).

TURICUM or Tigrurium. The ancient name of ZÜRICH, in Switzerland.

TURILLO (...), designed the imprenta real, at Madrid; a heavy building; its interior was done 1774 by J. P. Arnal.

TURIN. The English name of TORINO, in Italy.

TURKESS. To alter; as explained in WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., 1886, iii, 622; and SKEAT, *NOTES AND QUERIES*, 4th March 1882.

TURKISH ARCHITECTURE. See MAHOMEDAN ARCHITECTURE. The empire exists in Europe, Asia, and Africa. Osman (A.H. 687-726, or A.D. 1288-1326) was the founder of the empire; he is the ancestor of the reigning dynasty. The Turks had been for two centuries gradually progressing westward from their original seats in Central Asia, and at last in 1453 Constanti-

L. I.

nople fell into their power. Though barbarous, they belonged to one of the great building races of the world, and so soon as they entered the city, they set to work vigorously to vindicate the characteristics of the family. Besides appropriating seven or eight of the principal churches of the city, Mahomet II founded six or seven new mosques, some of great magnificence (SINAN, architect). They pulled down the church of the Apostles, the magnificent burying-place of the Christians, and (Christodoulos, a Christian resident, was employed to erect the monarch's new mosque, which unfortunately was greatly ruined by the earthquake of 1763, and the repairs have greatly disfigured it. There are about one hundred mosques in and about that city, all copies more or less of Sta. Sophia, of the merits of which they at once availed themselves. Not one has a pillared court like those of Egypt or Syria, nor an arcaded square like those of Persia or India, nor extended basilicas like those of Barlary or Spain. There are no palaces of any merit; in the richer houses, which are built around a courtyard, is a fine hall paved with marble having one or more fountains in them; the public fountains are pleasing features, but their beauty depends on the ornamentation; FERGUSSON, *History of Architecture*, 8vo., 1865-67, i. "Their minarets are exceptional features, and with the larger tombs are of great merit. The characteristics of Turkish architecture . . . are airiness and splendour, a light and brilliant appearance exhibited by many of the edifices while they continue in a state of perfection; unfortunately the frail materials of which they are composed, viz., wood painted over, render this appearance extremely transient, and the remains of magnificence thus everywhere blended with decay, gives an idea of squalidness which the ruins of a simpler fabric can never communicate"; WALPOLE, *Turkey* (Memoirs), 4to., 1817, p. 170. The Turkish office of works as existing in XVII cent., is related in EVLIYA, *Narrative*, 4to., 1834-50, ii, p. 230-3.

The following series may be useful in reference:—*Die Baukunst der Kirchen und Klöster im Orient*, in ALLGEMEINE BAUZEITUNG, 1857, pl. 139-154; giving plans, etc., of Athos; Meteoren; Sinai; S. Demetri, Smyrna; Navarin; mosaic in Dschemilah; Erivan; Adra; Salonichi; Jerusalem; Constantinople; Athens; Mistra; Tinos; Samari in Morea; with domes, windows, clock-tower in Isphahan; thrones and stalls; several plans of round churches; S. Kyriakos in Ancona; S. Anton in Padua; Templerkirche in Segovia; Erivan; S. Marcus, Venice; and others. Also *Die Kirchen des heiligen Landes*, 1864, pl. 646-50; church of Anna in Jerusalem; Maria Maggiore; Magdalen; Omar mosque; Peter; El Aksa; Holy Sepulchre; Dschebiel (Byblos); tomb of Jehosaphat; Johannes in Sebaste; and S. Georg in Lydda. SANDYS, *Journey begun 1610, containing a description of the Turkish Empire, of Egypt, their Antiquity, &c.*, 1652; 1672. JOANNE ET ISEMBERT, *Itin. descr. de l'Orient*, 12mo., 1860; HOMMAIRE DE HELL, *Voyage en Turquie et en Perse*, fol., 1853-60, gives pl. 34 Turkish work to palaces; and pl. 39 a bridge over the Euphrates. TOZER, *Researches in the Highlands of Turkey, including visits to Mounts Ida, Athos, Olympus, and Pelion*, 2 vols., 8vo., 1869. REID, *Turkey and the Turks*, 8vo., 1840, with plan of Constantinople. PARVILLE, *Architecture et Decoration Turques, au 15e Siècle*, preface by VIOLET-LE-DUC, 50 plates of the Mosquée à Brousse, Tomeau du Sultan Mohammed I, Mourahdieh, Brousse, Constantinople, etc., fol., Paris, 1874. OWEN JONES, *Grammar of Ornament*, fol., 1856; and 4to., 1865-66, gives chap. ix, Turkish Ornament; pl. 36, Ornaments in relief from mosques, tombs, and fountains at Constantinople; pl. 37, Painted Ornaments from the mosque of Soliman at Constantinople; pl. 38, Decoration of the dome of the tomb of Soliman I at Constantinople. OTTOMANISCHE BAUKUNST, fol., Const., 1875, 87 plates. HANDBOOK—TURKEY: Constantinople, the Bosphorus, the Dardanelles, Brousse, Plain of Troy, Crete, Cyprus, Smyrna, Ephesus, the Seven Churches, Coasts of the Black Sea, Armenia, Mesopotamia, etc., 12mo., 4th edit., 1878.

TURKISH BATH, or Roman bath. The oriental hot air bath; sweating house. *Detached Essay*, Bath, with illustrations.

Baths at POMPEII; and at Tuscolum. That of sultan Mahomet II at Constantinople, 1470; in DALY, *Revue Générale*, 1858, xvi, pl. 4. LANE, *Modern Egyptians*; KOHL, *Russia*; and ENCYC. BRITANNICA, 4to., 1876, 9th edition, s. v. Bath. The Turkish bath as practised at Constantinople, Damascus, Cairo, and the East generally is, hot air which becomes heavily charged with the vapour of water freely used in the bath. This vapour prevents the adoption of high temperatures which are necessary for therapeutic purposes, and these baths are simply luxurious methods of partial cleansing. The dry air Turkish bath introduced into England by David Urquhart, by the absolute exclusion of all moisture, enables the use of temperatures even of 240° Fahr. and upwards, the beneficial effects of this dry air are remarkable. URQUHART, *Art of Constructing a Turkish Bath, &c.*, in SOCIETY OF ARTS, etc., *Journal*, Feb. 1862. Sir J. FIFE, *Manual of the Turkish Bath; Heat as a mode of cure and a source of strength for men and animals*, 8vo., 1865.

In 1858 the system was introduced into Ireland by Dr. Barter, at Lincoln place, Dublin; and at Bray, designed by Sir John Benson. At Rathlin, Fermanagh (plate iii, 617), and Mount Keeper, Tipperary, are ancient baths; DUBLIN BUILDER *Journal*, 4to., 1859, i, 7, 17, 42, 57, 112; 166 Japanese: ii, 176, 304, 363; iii, 508; in treatment of insanity, 518; 606; Mulberry street baths, Liverpool, *idem*, 1861, iii, 617. Brighton; BUILDING NEWS *Journal*, 1867, xiv, 863, pl. 869; BUILDER *Journal*, 1868, xxvi, 786; xxvii, 331. Birmingham, B. J., 1879, xxxvii, 950. Dublin; St. Stephen's Green, Dublin, 1878, by A. G. Jones, architect. Dalton; B. J., 1882, xlii, 53; Leeds, *idem*, 593. Finchley, for horses; B. J., 1884, xlii, 802. Savoy hill, London, BRITISH ARCHITECT *Journal*, Jan. 1885, p. 40. BUILDING NEWS *Journal*, 1862, viii, 449, describes the Oriental baths in Victoria street, Westminster; and 1862, ix, p. 11, and 1863, x, 199-200, those in Jernyn street (after the style of the baths of sultan Mahomet at Constantinople), by G. Somers Clarke. The latest establishment is probably that at the Prince's club, Knightsbridge, opened June 1889.

HAY, at Liverpool, *On the Construction*, BUILDING NEWS *Journal*, 1861, vii, 143-4 (235; 257; 279); and 452. HAUGHTON, *Essay on the Oriental Bath*, 8vo., Dublin, 1860: *Facts and Fallacies of the T. B. system*, 8vo., 1860: *Ancient Roman Baths in England*, 1861. BARTHOLOMEW, *Guide to the T. B.*, 8vo., 1869. BUILDER *Journal*, 1857, xv, 615; 1861, xix, 388. BRUCE, at Philosophical Society of Glasgow, *Transactions*, 1879. Paper by HORN, in JOURNAL OF THE CLERKS OF THE WORKS ASSOCIATION, Aug. and Sept. 1889, p. 229, 241, quoting Erasmus Wilson, and Sir John Fife. ALLSOP, *The Turkish Bath, and its Design and Construction*. DUNLOP, *Philosophy of the Bath*, 3rd edit., 8vo., 1873. The Roman thermæ are described by ATTCHISON, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1889, p. 105; and the Turkish bath noticed, p. 110.

TURNABOUT or TURNBUCKLE. A fastener of iron or brass, which turns on a pivot, to secure a casement or cupboard door. Coarser ones are made of wood. The former had "cockspurs, and pullbacks at the hind side, to pull them to with"; NEVE, *Builder's Dictionary*, 8vo., 1736, s. v. Casement.

TURNBULL'S BLUE. A ferricyanide of iron; a variety of Prussian blue, being lighter and more delicate. It is believed to resist the action of alkalis longer than ordinary Prussian blue. It is used occasionally by the calico printer to obtain varied colours upon Turkey red cloth.

TURNED LEAD. The name (1703-36) for "lead" in casement glazing; after the "came" has passed through the vice. 4. TURNED WORK: see THROW or THRAUNE.

TURNER (JOSEPH), designed the gaol at Flint, under the act 25 George III, 1785; inscription given in the *Anthologia Hibernica*, 8vo., Dublin, 1793, ii, 256. Also the quaint gaol at Ruthin, Denbighshire, shown in JONES, *North Wales*, 4to., 1830. TURNER'S or CASSEL YELLOW; see PATENT YELLOW.

TURNGRECE; turne-grese (Lat. *cochlea*). A winding stair. *Vocabulary*, xv cent., Roy. MS. 17, c. xvii. TURNPIKE STAIR. 17.

TURNING PIECE. A board with one edge circular, for turning a thin arch of brick upon, as the breast of a chimney; or the trimming arch to a hearth.

TURNING SAW; see **KEYHOLE SAW.**

TURNOVER HINGE. A butt hinge which allows the door or cover to open flush in the front of the work.

TURNPIKE STAIR. A term given to the **CIRCULAR WINDING STAIR**, the "vis" or vice, or turret stair. KRAFFT, *Charpente*, fol., Paris, 1819-22; supp. 1840, pt. 2, pl. 19, terms it "commonly called English". One so called, at Eastbury house, Essex, is shown in CLARKE, *Eastbury*, 4to., 1834. COCHLEA. COCKLE STAIR. NEWEL. VIS. TURNING STAIR.

TURNSOLE BLUE. A colour of the shade of the heliotrope flower, used in painting; otherwise called heliotrope blue.

TUROU SEVERINULU, or Turn Severin; see **SOZORNEY.**

TURPENTINE. All turpentine are produced by making incisions in the living tree, from which a juice flows out. The best turpentine, that of Chio or Cyprus, pistachio tree, is not from the pine or fir genus; it has a fragrant smell, with a bitterish pungent taste. Strasburg turpentine, from the silver fir (**ABIES**), has an aromatic odour, very bitter taste, and is very clear. Venice turpentine, from the larch (**LARIX**), has a strong smell, hot disagreeable taste. Common turpentine from the Carolina pine (**PINUS**), a disagreeable odour and taste. Burgundy pitch, from the sap of the Spruce fir is clarified by boiling in water. (**PEGOLA** or Greek pitch and other names.) English turpentine is superior to others and free from offensive odour. When highly rectified and pure, turpentine is colourless, limpid, volatile, and inflammable. It is mixed with colours in various proportions, but only for internal work. During the American war of 1861-65 it was adulterated by admixture with mineral turpentine, which is extracted from petroleum or rock oil; this spirit is too often used for common work. It has bad drying qualities, and an unpleasant smell; *BUILDING NEWS Journal*, 1870, xviii, 328. Spoilt rum, a substitute as a desiccant of paint in lieu of turpentine, *BUILDING NEWS Journal*, 1863, x, 468; 1870, xviii, 328, adulteration: *BUILDER Journal*, 1863, xxi, 487. At this time "turpentine" was advertised as a "perfect substitute for turpentine": also "patent Geraldine spirit". The spirit (sold as naphtha) extracted from any mineral oil has specific gravity 7° 50 to 7° 80; it is used for mixing with turpentine, being called "turpentine substitute", and is frequently mixed with paint. It is sold as "mineral turpentine", and evaporates at an ordinary temperature; *Report of Select Committee on Fire prevention*, 1867, No. 471, Q. 4094-9; and 5779. **PENNY MAGAZINE**, 1843, xii, 43. *BUILDING NEWS Journal*, 1856, Trade in, ii, 876; 1870; xviii, oils, etc., 328. *BUILDER Journal*, 1863, xxi, 768, refers to *Journal Manuel de Peintures*, and the influence of essence of turpentine (terebenthine) upon the health of painters and occupiers of rooms.

TURPIN (JEAN), of Peronne, went January 1458 to Noyon cathedral and received a fee; in 1459 he gave a *devis* for the reconstruction of its choir; having Florent Bleuet as collaborator. He also directed the repairs of the "croisée de l'église vers l'ostel de mons. de Noyon". **MELICOCQ**, *Artistes du Nord*, 8vo., Béthune, 1848.

TURQUOISE. A greenish blue colour of various shades. Like the precious stones, which are chiefly known as oriental and occidental. 5. 14.

TURRELLUM. The low Latin term for a turret. 19.

TURRET (Old Eng. *turret*; Lat. *turris*; *turrellum*; Fr. *tourrelle*; *clocheton*, small when flanking a gable; It. *torrecella*; Ger. *thürmchen*; Sp. *mirador*; *torrecella*; Fr. *guimberge*; Ger. *wimberge*, gable flanked by its two pinnacles). A tower of great height in proportion to its diameter. A small tower attached to or forming part of a building; or placed at the angle of a church, or of a gatehouse. It often contains a circular staircase, or vis or vice; and sometimes it is finished by a spire, or pinnacles, or cupola (ogee-headed; MITRE-HEADED turret). **BAPTIZAN.** Large towers have often turrets at their corners.

"I have read of one sir William Champney, once living in Tower street, London, in the reign of king Henry III, who was the first man in England who ever built a turret on the top of his house, that he might the better overlook his neighbours; but it so fell out, that not long after he was struck blind"; **PICTORIAL BIBLE**, 1836, ii, 111. *Souvenirs du Vieux Paris*, fol., 12th edit., 1836, many throughout. **GAILHABAUD**, *Architecture du Vnc siècle*, 4to., Paris, 1854, iii, pl. 9, sur la place de la Grève. *Angle Turrets at Paris*, *BUILDER Journal*, 1858, xvi, 455; 570. *Turret at S. Alban's*, *BUILDING NEWS Journal*, 1866, xiii, 22. 1. 14. 17. 18.

TURRIANO (ORAZIO), and perhaps Torreggiano, of Rome, where he restored in modern style, about 1600, the chiesa di S. Marco, destroying its ancient character (it had been repaired 1468 by G. da Majano who added the façade and the contiguous palazzo); **LETAROUILLY**, *Rome Moderne*, fol., Rome, 1840, p. 215, pl. 73. The palace of S. Callisto is ascribed to one of this name, some of whose drawings have been etched for architectural works. The designs named s. v. **TORRIANO (H.)** are no doubt by the same architect. 68

TURRIANO (JANELO), and Juanelo or Joanelo, were engineers employed 1564 and 1593 and 1571 on waterworks at Toledo and Colmenar, in Spain. 66.

TURKIS NERVORIUM, and **TORNACUM.** The ancient names of **TOURNAI**, in Belgium.

TURSENI. The ancient Etruscans; **TUSCIA**; **TYRRHENI.**

TUSAPAN. A village in Yucatan, north of Mexico; it is the site of an Indian city supposed to have belonged to the Totonacs. A large **TROCALLA** is given in **NEBEL**, *Voyage Pitt. et Archéol. du Mexique*, fol., Paris, 1836; and **GAILHABAUD**, *Monuments*, 4to., Paris, 1850, at end of iv.

TUSCAN ARCHITECTURE. The earlier part is given under **ETRURIA**, which extended southwards as far as the river Tiber. See also **ITALIAN ARCHITECTURE** and **ITALIAN POINTED ARCHITECTURE.** The chief cities in the Tuscan states are Arezzo; Borgo San Sepolcro; Chiusi; Colle; Cortona; Fiesole; Firenze; Grosseto; Livorno; Massa Marittima; Montalcino; Monte Pulciano; Pescia; Pietra Santa; Pisa; Pistoia; Pontremoli; Prato; San Miniato; Siena; Sovana; Volterra. **GWILT**, in **CHAMBERS**, *Civil Architecture*, 8vo., 1825, i, xxx, says, "The Tuscan school for grandeur and exhibition of the picturesque is without parallel"; also **GWILT**, *Encyc. of Architecture*, where Tuscan Gothic is described as remarkable in the earlier periods for its simplicity, and in the later as being extremely beautiful. At Pisa is seen the peculiar features of Tuscan cities, the wide projecting roofs to keep off the sun, and the general character of massy solidity and gravity.

TUSCANY; *Viaggio Pittorresco della T.*, 3 vols., fol., Fir., 1801-3. **GOZZINI**, *Monumenti Sepolcrali della T.*, 4to., Flor., 1819. **PERINI**, *Churches of Florence and Tuscany*, fol. **FONTANI**, *Viaggio Pittorico della Tos.*, 18mo., 1817. **ANGUILLES**, *Not. ist. Palazzi e Ville, etc., Tos.*, 8vo., 1815. **ZOCCHI**, *Vedute delle Ville, etc., della T.*, fol., Fir., 1744. **MORENI**, *Delle Belli Arti*, 8vo., 1812. *Scrizio di ritratto d'Uomini illustri Toscani*, fol., 1766-73. **GRANDJEAN** de **MONTIGNY** et **FAMIN**, *Palais, maisons, églises, etc., de la T.*, 109 pl., fol., Paris, 1837; 109 pl., 1875. **ROHAULT DE FLEURY**, *La T. au Moyen-Age, Architecture civile et militaire*, fol., Paris, 1873. *Cathedrals of T.*, in **ECCLESIOLOGIST Journal**, 1868, xxvi, 316; *BUILDING NEWS Journal*, 1869, xvi. *Handbook to Northern Italy*, edit. 1842, p. 427-33, and introduction. **WARING**, *Arts connected with Architecture in T.*, read at **ROY. INST. OF BRIT. ARCHITECTS**, *Sessional Papers*, 1857. **PERKINS**, *Tuscan Sculptors*, 4to., 1865. **GNAUTH** and **FÖRSTER**, *Die Bauwerke der Ren. in T.*, fol., Vienna, 1867. **GEYMULLER**, **STEGMANN**, etc., *Architektur der Renaissance in T.*, fol., Munich, 1885-88. **ORIOLI**, *Sepolcrali edifizii dell' Etruria media e in generale dell' Arch. T.*, 4to., Fiesole, 1826. **RASCHDORFF**, *Palast Archit. von Italien und Tos. XV bis XVII Jahrh.*, fol., 1883.

TUSCAN ORDER (Fr. *Toscan*). The areostyle is a term composed of two Greek words, *apaia* rare, and *στυλος* column,

This is the fourth species of temple according to columnar arrangement, described by VITRUVIUS, iii, 2, 3. Without specifying the precise width of the intercolumniations, he applied the term to all examples where the columns were more than three diameters apart; and in consequence the *epistylia* or architraves were of wood, as stone could not be found sufficiently lengthy or strong enough for the bearing. To render the weight above as light as possible, he states that the pediments in such cases were filled in with sculptures of terra-cotta or bronze-gilt "Tuscanico more". He mentions as examples the temple to Ceres near the Circus Maximus, that of Pompeian Hercules, and the ancient temple of Jupiter Capitolinus. It may therefore be supposed such a temple was built in very early times, and of the rudest materials. The portico of the church of S. Paul, Covent Garden, designed 1631-8 by Inigo Jones, is of the precise dimensions laid down by VITRUVIUS. Thus although PERRAULT suggests a limitation of four diameters for the intercolumniation, it does not appear that the ancients restricted themselves within any such limit, but gave such a spacing as convenience or the special purpose of the building for practical use required.

* T. L. D.

The tetrastyle portico at CORA, usually known as the temple to Hercules, is suggested by QUATREMÈRE DE QUINCY, *Diet.*, s. v., to exhibit the Vitruvian Tuscan order. DENNIS, *Etruria*, 8vo., 2nd edit., 1878, i, lxxv; and tombs at Norchia (202); at Cervetri, grotto dell' Alcova (241); and grotto Torlonia (277) afford examples: also the subterranean tomb at Clusium, now Chiusi, of an earlier age than the amphitheatres; and the column of Trajan (as insisted upon as an example by CHAMBRAY); also the temple to Jupiter Tarpeius built by Tarquin, for which he brought an architect from Etruria (LIVY, i), which temple was most admired by Constantius when he went to Rome (AMMIAN. MARCEL., xvi, p. 71), even amidst those of Venus and of Peace. A Tuscan temple at Misanello, restored by Zaunoni, is given in BURTON, *Etruscan Bologna*, 8vo., 1876, p. 121.

The Etruscan and Doric orders have been reciprocally taken for each other, and indistinctly described by authors. VITRUVIUS, iv, 7, almost considers it a Doric order. Some authors assert that the order used in the amphitheatres at Verona, Pola, Nismes, and Capua are Tuscan, others say Doric (as SERLIO, PALLADIO, D'AVILER, SAN FELICI, MAZOCCHIO, and BLONDEL). That of Capua was certainly Tuscan below and Doric above (SWINBURNE, *Travels*, 4to., 1779-87, p. 328). Some writers doubt if the Tuscan can be a regular order (CHAMBRAY, D'AVILER), others writing professedly of the orders, have passed over the Tuscan (ALBERTI). Many have drawn on their imagination for the ornaments (SERLIO; PHILANDER; BAROZZI; SCAMOZZI). MAFFEI, *History of Ancient Amphitheatres*, 8vo., 1730, pp. 229-33, approves of SERLIO's and PALLADIO's attempts from Verona, but the latter neglected the upper order, and he explains the constitution and division of those ornaments; its members will be found very differently divided from those of the lower orders, yet not with less symmetry, and certainly with more majestic solidity; massy strength was its predominant character. The present delineations of the order are the result of interpretations of architects on the passage in VITRUVIUS, who makes the columns six diameters in height with a diminution of one quarter of a diameter; the base and capital each one module in height: no height is given for the architrave or cornice, and the frieze is omitted; mutules are placed over the architrave to project one fourth of the total height of the column. A pedestal is not named. The criticisms and design for this order by CHAMBERS, *Decorative part of Civil Architecture*, fol., 1759, and later editions should be studied. The "grotesque Tuscan order" at the York stairs water-gate, by Inigo Jones, or N. Stone; and the "Tuscan order" by sir C. Wren at S. Antholin's church, Watling street, are given in LANGLEY, *Masonry*, fol., 1736, pl. 28 and 29.

1. 11. 14. 25.

MÜLLER, *Etrusk.*, iii, 6; iv, 2-5. INGHIRAMI, *Mons. Etrus.*, iv, 1-51; ABEKEN, *Mittelaltien*, 202-33; CANINA, *Etruria Marit-*

ima, fol., Rome, 1846-9, ii, 153-62. KLENZE, *Versuch der Wiederherstellung des Toscanischen Tempels*, 4to., Munich, 1821. MAUCH, *Architektonischen Ordnungen*, 4to., 6th edit., 1872.

To double the base as VITRUVIUS prescribes, SERLIO, *Architettura*, fol., Venice, 1663, p. 4, justly says is the simple problem of double *area* and not double *projection*. VITRUVIUS, iv, 7, in the chapter on "Tuscan temples", uses the word HUMERUS, the explanation of which is endeavoured to be given s. v.

TUSCANICO MORE. See TUSCAN ORDER.

TUSCIA; TUSCI; or Etrusci; hence Tuscany. TURSENTI.

TUSCULANUS; LAPIS. The local *sperone*, at Tusculum or FRASCATI, is a volcanic conglomerate of yellow cinders hardened or baked by the lava which has risen under it. It was used for all the ancient works about two miles from Frascati, as named s. v. It is seldom met elsewhere amongst Italian volcanoes. At the end of 2nd century of Rome, the *sperone* came in from the quarries at Gabii, "Lapis Gabinus", in the time of the Tarquins and the early part of the republic. It so much resembles the PEPERINO that it is not always easy to distinguish them, but peperino is harder than sperone; PARKER, *Walls of Rome*, 8vo., 1874, p. iii; 2; 7.

TUSCULUM. A strong and ancient city of Latium, and twice the rival of Rome. It consisted of the town itself, and the arx or citadel, which was isolated from it. A few traces of the walls of the latter remain. After the war of Justinian, and the inroads of the Lombards, it regained more than its ancient splendour; the counts of Tusculum were supreme in Rome; and the city remained entire till near the end of the XII cent.; the walls were destroyed *cir.* 1168 or 1191. The imperial villa of Tiberius was at some distance to the west of the town. The hill on which the city was built was adorned by villas. Lucullus was the first to build a magnificent edifice; a ruin 90 ft. diam. inside is thought to be his sepulchre, though a smaller one is commonly identified for it. Also the villa of Sulla, later of Cicero; another of Gabinius; CARDONI, *De Tusc. M. T. Ciceronis*; ZUZZARI, *Antica Villa*, etc. Besides these remains are vestiges of the walls; a large quadrilateral piscina; a theatre, more perfect than any near Rome; another or an odeum; a Roman milestone recording 15 miles; an aqueduct with pointed arches formed of stone in courses; a columbarium; and an amphitheatre. Many of the inscriptions found are placed in the Villa Rufinella. Near the hermitage at Camaldoli was discovered 1667 a very ancient tomb of the Furi (FALCONIERI, *Inscr. Athleticæ*, 8vo., Rome, 1668, p. 143). Part of the thermæ is given s. c. Bath, in ENCY. BURT., 9th edit., 1876, p. 435. CANINA, *Descr. dell' antico Tuscolo*, fol., Rome, 1841. NIBBY, *Dintorni di Roma*, 8vo., 1837, iii. COMPAGNONI, *Ist. dell' antico T.* (4to., 1782-3). FREEMAN, *Historical Sketches*, 8vo., 1876, p. 172-81. FRASCATI. GELL, *Topography of Rome*, 8vo., 1834. 23. 25. 28.

TUSH NAILING. see TOSH NAILING.

TUSK. A bevel shoulder, made above a tenon of a joist, let into a girder, to strengthen the tenon. TUSK TENON. "If the joices do bear at above ten foot in length, it ought to be the care of the master workman to provide stronger stuff for them, viz, thicker and broader. If not, they cut a tusk on the upper side of the tenant, and let that tusk into the upper side of the girders"; MOXON, *Mechanick Exercises* (Carpentry), 4to., 1694, p. 136, 168. The term is also used in scarfing for the small projection of each timber at the joint, which is considered to strengthen it; it is sometimes buried in the timber so as not to show on the outside; ARCHITECT, ETC., *Journal*, 1849, i, 155; CHRISTY, *Joints*, 8vo., 1882.

TUSSES. An old English word for, and the same as TOOTHING in London; and "tushes" in some parts of England. 1412, "Richard de sall putte oute 'tusses' for the making of a revestery"; RAINE, *Cuttlerick Church*, Yorks., 8vo., 1834, p. 9. 17. 19.

TUSSIS (TEMPLE TO) or tempio della Tosse. See TRIVOLI. 28.

TUTBURY QUARRIES, situated near Lichfield, Staffordshire, supplied the alabaster 1863-4 for the redos of the cathedral.

TUTZIS. A village in Nubia, now situated on the river Nile, but formerly a quarter of a mile distant, and now represented by Ger el Hossayn of WILKINSON, also Girscheli, Guircheli, Girche (Fr. Guirché), Girgeh and Jirgeh. Of the remains of the partly rock-cut temple dedicated to Phtha, by Rameses the great, the Greek Sesostris, about 1600 B.C., the pylon is about 180 ft. long; an open atrium having remains of eight figures with one arm down, against piers all formed in courses; a hall of six colossi piers having both arms folded; and in the wall behind them eight statues of Ra in square niches. Beyond this hall is a two-pillared secos with five cells out of it, the centre one or sanctuary of Ra having at the end four seated statues and an altar. GAU, *Nubie*, fol., Paris, 1822, pl. 27-32. EDWARDS, *Up the Nile*, 4to., 1877, ii, 546. 28. 50.

TUY and **TUI** (Anc. Tude and Tude ad Fines). A town in Galicia, Spain, situated on the river Miño, over which is an international iron bridge, nearly 1,200 ft. long. Built by the Goths, it was destroyed 716 by the Moors, rebuilt, again destroyed by the Moors, and rebuilt by Fernando II of Leon, who erected the castle; and a palace, now the residence of the bishop. The old wall is flanked by square towers. The castellated cathedral dedicated to the Assumption of the Virgin, of granite, begun 1145, has good Romanesque and early Pointed work; the chancel has been modernised; the nave and aisles have five bays; the blind triforium has very large square abaci; the clear-story is bricked up. The chapel of S. Telmo dates 1579. An iron belfry. The cloisters on the south have good early Pointed work and double shafts. The church of Santo Domingo has a spoilt pentagonal apse, a fine chancel, and two chapels of good transitional work; two tombs have the nail-head ornament. There are other churches and monasteries, a townhouse, prison, and a theatre. PR. de SANDOVAL, *Antigüedad de la ciudad y iglesia cath. de Tuy, y de sus obispos*, 4to., Braga, 1610. 14.28.50.96.

TUYERE, tue, and tuye; tue iron. **TEWEL** (Fr. *tuyan*).

TVERDOJ (NICHOLAS), of Spalato, finished the campanile at Spalato, begun 1300-23, and resumed by him about 1360 until 1416; the octagonal lantern was a later work; JACKSON, *Architecture of Dalmatia*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1887, p. 173.

TWELFTH CENTURY WORK. See NORMAN ARCHITECTURE; EARLY ENGLISH ARCHITECTURE; TRANSITION PERIOD. *Twelfth Century Work in Iceland*, BUILDER JOURNAL, 1864, xxii, 721. *Manners of the XI and XII Centuries*, by UPCOTT, *Original Letters*, etc., London, 1836, in QUARTERLY REVIEW, 1837, vol. lxxviii, 414-64.

TWICHYNGROPES. A word used 1478, "et pro factura iiii petr. canabi veteris in twichyngropes pro les scaffald", or ropes used then as now for twiching round upright poles of the scaffold to support the ledgers. SURTEES SOCIETY, *York Fabrick Rolls*, 8vo., Durham, 1859, p. 83, 358.

TWINING SAW; see KEYHOLE SAW.

TWINNET. A local name for ginlet. R. R. R.

TWIRL. "Tirling at the door-pin", is "twirling the handle of the latch"; JAMIESON, *Dictionary*.

TWISTED COLUMN. A plain shaft screwed or twisted with six circumvolutions. "Twisted fluted", has the side following the centre of the shaft in a spiral line through the whole length. A third of the shaft is often fluted, the rest being adorned with cabling and ornaments. Examples occur in the paintings of Rubens, Vandyke, and others of their school; in Raffaello's paintings; and at the porch of S. Mary's church, Oxford, said to be done by N. Stone for arch. Laud. Inigo Jones did not use such shafts. Bernini used them, 4 French feet in diameter, in the baldachino in S. Peter's at Rome. At Monreale, Palermo, and other places they are seen: as also to the shrine of Edward the confessor in Westminster abbey, the flutes inlaid with mosaic. In the reredos at Ely cathedral the shafts are enriched with polished lapidary work.

TWISTING. The same as wrenching; see TORSION.

Unless planks be placed on edge to season, or kept under ARCH. PUB. SOC.

great weights while flat, the edges will rise on the side most influenced by warmth; large knots and gnarls will cause sawn wood to twist, or cast, or wind. Framed joinery often has a permanent twist caused by unequal pressure of a screw cramp while being wedged up. R. R. R.

TWIST RULE. A bevel for working the coping of (sloping) curved walls, as at ends of bridges.

TWITCHEL. A narrow street or foot-path forming a short cut between two places. At Shillington, Bedfordshire, the twitchel is the nearest way to the parish church. "Twitchell behinde the church dore"; NOTES AND QUERIES, 6 Ser., viii, 495. An area behind a house and between it and another building, as at Luton, Bedfordshire.

TWIVIL. A tool used by carpenters to make large mortices in rough timber; holes being bored through with a centre-bit or auger, and the interstices chopped away by a twivil. R. R. R.

TWO PAIR FLOOR. The same as SECOND FLOOR.

TWRCH, or **Toorch** (RICHARD), 1586, at Beaupre or Bewper castle, Glamorganshire, did the entrance porch of three orders, and the chapel, for the Bassetts family. NICHOLAS, *History of Glam.*, 8vo., 1874. Iolo Morganwg, in *Cambrian Journal*, v, 138.

TWYBILL. A pickaxe with chisel-pointed ends $2\frac{1}{2}$ ins. wide; one blade being in a line with the handle, the other set at right angles. It is chiefly used in clearing woodland. R. R. R.

TYCHICUS. This name is inscribed "architect" of the tomb of TI. C. VITALIS, in the villa Volkonski, at Rome; DONALDSON, *On the Tomb of Vitalis*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1868-69, p. 223-7. This name occurs in the inscription on a slab in the grand corridor of the Vatican, "Dis manibus Tychico Imp Dom ser architecto cryspini ti Claudius primus ollam ossuariam donavit." A. G. Haterius Tychicus appears in another as foreman of the public works and a "Redemptor", and as having built a temple to Hercules at his own cost. 68.

TYER. The band of lead formerly soldered on lead glazing, to tie or twist over a bar to fasten it tight; stout copper wire is now generally used for the purpose. 4.

TYLE. The old way of writing TILE. TYLING; see TILING.

TYLER (WILLIAM), nominated R.A. 1768, as a sculptor; 1754 carved with R. Ashton the monument to M. Folkes; and executed those 1772 to B. Booth; 1774 to Dr. Z. Pearce; 1783 to John Storr, esq., all in Westminster abbey; and 1760 made a design for one to general Wolfe. He exhibited at the society of artists of Great Britain; his other works 1760-68 were in sculpture; besides some at the royal academy down to 1780. In 1784 designed the city gaol at Dorchester; the ordnance office, Margaret street, Old Palace yard, Westminster, pulled down under Act of Parliament passed 10 July 1805 (where the statue to Geo. Canning now stands); 1786 the Freemasons' tavern, Great Queen street (BRITTON, *Public Edifices*, 8vo., 1828); a design for a town hall at Bridport; with 1800 the villa Maria for H.R.H. the duchess of Gloucester, near Kensington. A silver cup, valued at 50 guineas, was presented to him by the royal academy for the report, in conjunction with G. Dance, on the treasurer's report of 1799; SANDBY, *History of the Royal Academy*, 8vo., 1862, p. 119. He died 1801. His name appears without the epithet of architect, in MALTON, *London and Westminster*, fol., 1792, p. 7.

TYLLE, Tylle-thakker. See TILE and THATCH.

TYMBRE. A former term in heraldry for the crest or device upon a helmet. Also applied to a bell-turret on the roof of a hall, as to the spire of the old kitchen at Stanton Harcourt, Oxfordshire. 19.

TYMPANARIUM. Late Latin for a bell-tower.

TYMPANUM; **TYMPAN** (Gr. *deros*; *AETOS*; *DELTOΣ*; Lat. *AQUILA*). The triangular recessed space of a pediment, being either plain or filled with ornaments and sculpture raised from the plane of the triangle. The face of it usually ranges with that of the frieze beneath, but at the temple at Ægina it is placed behind that feature. INWOOD, *Erechtheion*, fol., 1824, FF

p. 140, pl. 26, states that three examples show a rose only placed in the centre of the tympanum, and the remainder left plain. When small, it is best left without ornament. I. 4.

The term has also been given to the square or die of a wood pedestal; and to the panel of a door.

It is also given to the triangular table at angles of arches, and decorated with branches of laurel, olive, or oak, or with trophies, as in the Doric and Ionic orders; or if richer, with flying or sitting figures, as in the other orders.

TYPE and TIPPE. A small cupola; also the canopy over a pulpit; SOUNDING BOARD. The leaden cupola with crockets, pinnacles, and gilded vanes, in Tudor architecture; Low, *Hampton Court*, 4to., 1885, i, 27; 347. 1532, "takyng downe of the iiij types upon the great White Tower, and casting and chasyng of the same iiij types." "The carpentry work of the said types . . . that is to say joyst peeces and bolts to the top of them . . . a chargeable pece of work to doo . . . hythning of the iiij types with bryckeworke and rowghcastyng of those types"; BAYLEY, *History of the Tower*, fol., 1824-5; pt. i, App., p. xix, xxiii, xxvii. In 1607-8, "50 foote half-ynech bord to cover ye type of ye lover", at Trinity college; the louvre itself was covered with tin; WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 8vo., 1886, ii, 493.

The moulds, or ware made out of moulds. ECTYPE, ENTTYPE, PROSTUPA, prostype, or prototype. GELL, *Pompeiana*, 4to., 1819-32, considers *ectype* to be work decorated on the edges, *prototype* in front. 25.

The technical word for an original work serving as a model which has been or may be copied. The standard or type of Greek sculpture is nature. "We may easily trace in the architecture of nations the types of three distinct states of life, which are clearly discoverable at the present time; though in some cases the types may be thought doubtful"; GWILT, *Encyc.*, 1845.

TYPHLOCOMIUM. An infirmary for the blind.

TYPHON. A figure or angel of death, or significant of the principle of destruction, in Etruscan tombs; it is winged with legs representing serpents, as at Tarquinii; DENNIS, *Etruria*, 8vo., 1848, i, 304-5; ii, 183; or edit. 1883, examples i, 168; 253; at Sovana, ii, 12; 173; tomb of the Typhon, or grotto del tifone, or grotto de' Pompei, in Corneto cemetery, discovered 1832, i, 327-9. TELAMONES.

The figure occurs frequently on Egyptian monuments with some variations in its forms, but always characterised by the broad, coarse, and frightful face, and by the large tongue lolling out; a type is given in WILKINSON, *Manners, etc., of Ancient Egyptians*, 8vo., 1837-41; and repeated in WRIGHT, *History of Caricature*, 4to., 1865, p. 9, who considers it was represented in Greece by what is now called the GORGON; as in PANOFKA, *Terracotten des Museums Berlin*, 4to., 1842, pl. lxi, p. 154. In the quadrangle at Philæ is a quasi-heraldic group representing the sacred hawk sitting in the centre of a fan-shaped persea tree between two supporters, on one side being a maniacal lion and on the other a Typhonian hippopotamus, each grasping a pair of shears; EDWARDS, *Up the Nile*, 4to., 1877, i, 317; 2nd edit., 1889, p. 215. At Jebel Barkal, or Mount Barkal, is a temple called the Typhonium from several of such figures still remaining, dated XVII or XIX cent. B.C.

TYPHONIUM. A class of temples, improperly so called, of Egypt. APOLLINOPOLIS MAGNA.

TYRAUNS and TRAUN; see TIRAUNT.

TYRE; see TYRUS, in Phœnicia.

TYREE MARBLE. One of the few islands in the Hebrides where limestones are found. Two varieties occur at Balephetrish, on the north-west side of the island. One is a beautiful pink with dark green spots, due to peroxide of iron and crystals of horn-

blende; it is most useful for inlaying, and takes a good polish. The other is white, but too hard for ordinary working; as a facing stone for exterior work it is almost imperishable; BUILDING NEWS Journal, 1870, xix, 283.

TYRIAN and TURUM MARBLE; see GRECO-TURCHINECCHIO.

TYROLESE MARBLE. The Roman basilica of S. Bonifacius, at Munich, designed 1835-50 by . . . Ziebland, has in the nave sixty-four monolithic columns of (grizzled) grey Tyrolese marble 20 ft. long; BUILDER Journal, 1848, vi, 547; 1850, viii, 589.

TYRON (JOHAN BAPTISTA). A monk of Gloucester, designed or erected about 1437 the shrine in Boteler's chapel on the north side of the entrance into the Lady chapel; record verses are given in RUDDER, *Gloucestershire*, fol., Cirencester, 1779, p. 176; and FOSBROKE, *Gloucester*, fol., 1819, ii, 129, col. b.

TYRRHENI, Tyrseni, Turseni, Tuscina, Rasena. See ETRUSCAN ARCHITECTURE.

TYRUS (Syr. *Sār*, Engl. Tyre). The most celebrated and important city of Phœnicia; built partly on the mainland and partly on an island. Its wall where facing the former was 150 ft. high; and the houses were lofty, being built story on story (like Aradus, and the insule of Rome). Benjamin of Tudela, latter part of XII cent., mentions that towers, markets, streets, and halls might be seen at the bottom of the sea. Hiram, B.C. 969, thirty-four years king, improved the city, temp. of David and Solomon. It sustained the sieges of Shalmeneser, Nebuchadnezzar, Alexander, and Antigonus; that by Alexander was remarkable, took seven months to July 332 B.C., and is narrated by ARRIAN (*Anab.*, ii, 17-26), DIODORUS SICULUS (xvii, 40-45), and Q. CURTIUS (iv, 4, 27): it was reoccupied by Carians chiefly. Thus there was a Phœnician, a Roman, a mediæval, and now a modern Tyre, each built on the ruins of its predecessor. Within the modern town the only thing worthy of notice is an old church in the south-east angle, probably the remains of the once large church erected by Paulinus, bishop of Tyre in IV cent., the most splendid of all the temples in Phœnicia; it was 216 ft. by 136 ft. Tyre, under and above water, has been used for years as a quarry for the repair of the fortifications of 'Akka, and for the modern houses at Beyrout and elsewhere. The aqueducts are attributed to Solomon by POCOCCO, *Descr. of the East*, fol., 1743-5, who gives a view, as in *Detached Essays*, Aqueduct, p. 2, pl. 2, fig. 16. PHœNICIAN ART. 14. 28. 50.

SHAW, *Travels*, 4to., London, 1757. ROBINSON, *Palestine*, 8vo., 1841; 1867, iii, 684. CASSAS, *Voy. Pitt. de la Syrie*, fol., Paris, 1798, ii, gives the aqueduct; also in *Illustrations*, 18, pl. 12. KENRICK, *Phœnicia*, 8vo., 1855, p. 353. NEWBOLD, *The Country between Tyre and Sidon and the River Jordan*, in ROYAL ASIATIC SOCIETY, *Transactions*, 1847. PORTER, *Giant Cities*, 8vo., 1867, p. 273. RENAN, *Mission de Phœnicie*, 4to. and fol., Paris, 1863-74; PERRET ET CHAPIEZ, *Hist. de l'Arch. dans l'Antiquité*, iii, Phœnicie, 8vo., Paris, 1885. RAWLINSON, *History of Phœnicia*, 8vo., 1889.

TYRYNGTONE (JOHN DE), was one of the masons whose name appears attached to the Regulations for the trade of masons, 30 Edward III, A.D. 1356, on behalf of the masons' hewers; RILEY, *Memorials of London*, 4to., 1868, p. 280-2.

TYRYNS; Tyrinth. See TRYNS, in the Morea.

TYSDRUS. The ancient name of EL JEMM, in Tunisia.

TYTL (EUGEN JOHANN HEINRICH), born Nov. 18, 1666, at Dovrzsich, was abbot of the Cistercian monastery of Plass, in Bohemia. He built the beautiful chapel in Mlatz; the church at Teynitz, near Kralowicz; and 1704 the monastery at Plass, on 6666 piles driven into a morass; its underground water-courses, flying staircase, and the winding staircases were admired. He died 1738 in the abbey, aged 72. 20. 26. 68.

TZARSCO-CELO, Tzarsco-selo, Tzarskoeselo, Tsarskoe Selo (Imperial spot); see ZARSKO SELO.

THE DICTIONARY OF ARCHITECTURE.

UDAI

UALURYNG. An old way of writing ALURE.

UBEDA. A city in Andalusia, in Spain, situated on the river Guadalquivir. The walls are in a ruinous state, but numerous towers and ten gates remain. The place was built by the Moors with the materials of the Roman Bétula, now Ubeda la vieja, and its whole aspect is Moorish. Of the numerous churches, S. Michael, once a mosque, is the most noticeable; and S. Salvador, 1540-56 by P. de Valdevira, for F. de los Cobos, for whom 1550 he designed a palace, both of the Corinthian order richly decorated. There were nine monasteries with three nunneries, only three are now used; an unfinished town-house with a good façade; a hospital and chapel of Santiago 1562 by A. Valdevira; and the usual town buildings. 14. 50. 66.

UBERTI (PAUL DEGLI) called Farinato, also a painter, born 1522 at Verona, where many edifices exist of his design. He died aged 84. His son HORATIO was a pupil. 5.

UCETA (MARTIN DE), a native of Vizcaya, directed the works of the important collegiate church of S. Nicolas, at Alicante; and died 10 March 1630. 66.

UCETA (JUAN DE), 1612 designed and executed the now destroyed monument of Semana in the cathedral at Oviedo, with other works there. 66.

UCETIA. The ancient name of UZES, in France.

UCLÉS. A village in New Castile, in Spain. On the steep hill is the enormous and once magnificent and chief monastery of the order of Santiago, the church of which is one of the finest in Spain; the abbot was mitred. It was founded 1174 on the site of a Moorish *alcazar*, the tower of which is still on the south side; it is now occupied by the Jesuits. This front is in a bad Churrigueresque style, the east in the Berruguete, and the north and west in the Classical: its chapel 1600 is a simple Herrera style. The design was made 1528-32 by G. de Vega, and was continued by the following architects as maestro mayores:—1576, April 19, P. de Tolosa; 1583, Oct. 18, D. de Alcantara; 1587, F. de Mora; 1592, April 13, B. Ruiz; 1593, A. de Segura who designed the dome completed 1597; 1605, P. Garcia de Mazuecos; 1611, March 18, P. de Lizargarate and A. Carbonel; 1668, F. G. Dardero of Quintanar, who 1672 did the *reja* and retablo. There are a town house, small hospital, granary, church, two suppressed monasteries, and four hermitages. 28. 50. 66.

UDAI PUR, native Udayapura; and formerly written Odeypoor, Oodeypore, Oodeepoor, Oodipore, Oodipoor, "City of Sunrise." The capital of the native state of Mewar, in Rajpootana; formerly a large portion was called Mewar or Meywar. It superseded the ancient capital of Chittore after its sack by Akbar in May 1568, being founded by the maharana Udai Singh (died 1572) of Mewar. There are two *bunds* or reservoirs, built

UDIB

1653-80 and 1680-99; FERGUSON, *Pict. Illustrations*, fol. 1848, pl. 12, 13; and a chuttry, pl. 14. The finest of the numerous lakes and tanks in the state are the Dhebar or Jaisamand, the Rajnagar or Rajsamand, and the Udai Sagar. The first, some 20 miles to the south-east, is perhaps the largest sheet of artificial water in the world; about 9 miles long by 5 broad, and covers an area of nearly 21 square miles; the dam of masonry is 1,000 ft. long by 95 ft. high, 50 ft. wide at the base and 15 ft. at the top. The second lake, about 25 miles northwards, is 3 miles by 1½ miles and covers an area of 2.9 square miles; it took seven years to build, and is said to have cost 96 lakhs, or £960,000. The third, after 1568, five miles east, is nearly the same size, and 2 square miles in area. The Pachola lake, at the capital, of somewhat later date, is 2¼ by 1¼ miles with an area of 1.2 square miles. These four lakes drain 1,127 square miles of country.

The palaces and garden residences on the lake to the west of the city are numerous; the royal palace of red sandstone is described by TOD, *Annals of Rajasthan*, 4to., 1829, i, 211; 405-7, as "there is not in the East a more striking or majestic structure". Tombs exist here in hundreds, from the simple domical canopy supported on four shafts, to the splendid chuttry, whose octagonal dome is supported by fifty-six. Amongst the finest is that of Singram Singh, buried 1733. The cenotaph in the cemetery of Maha Sati has only twelve columns (it may date in the present XIX century); it is considered by FERGUSON, *Indian, etc., Architecture*, 8vo., 1876, p. 470-3, to be, *mutatis mutandis*, identical with the celebrated tomb at Halicarnassus; these two illustrations are practically in the Jaina style of architecture. TOD describes (i, 793) Ar or Ahar, three miles from the city, where is the *mahasath* or cemetery, containing the cenotaphs of all the kings of the place, among which that of Umra Singh's is the most conspicuous; they are of white marble from the quarries of Kankerowli; also the ruins of temples which were used in erecting these sepulchres. ILLUSTRATED LONDON NEWS, 1858, xxxiii, 45. ROUSSELET, *L'Inde des Rajahs*, 4to., Paris, 1875. The temple to Jagannath is illustrated by SIMPSON, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1889, p. 64, pl. xii. HUNTER, *Imp. Gazetteer of India*, 8vo., London, 1887, xiii. There is another Oodeypoor in Malwa, best known for its extensive ruins; also a Udaipur in Bengal. 14.

UDARTE or EDOUARD (PHILIPPE), with others from France, were employed about 1517 on the church, etc., of Sta. Cruz at Coimbra. (NICOLAS.) DUSSIEUX, *Les Artistes Français*, 8vo., Paris, 1851, lix.

UDIAS (ANDRES DE). See GARCIA (A.).

UDIBRANDO DEL GIUDICE, is stated in the registers to have been directing architect over Busketus and Rainaldus, at

the *duomo* at Pisa, perhaps 1083-1116. (CICOGNARA, *Storia*, fol., Venice, 1818, i, 178-83).

UDINE (Anc. Vedinum, Utinum, Utine, and Utinium). The capital of the delegation of Friuli, in northern Italy, situated on a plain between the rivers Torre and Cormare. The inner and outer towns are both surrounded by walls and ditches; its castle 1517 by G. Fontana, is now a prison; the *scala* by G. da Udine. There are six gates; the streets crooked and lined with arcades; the great square has a memorial pillar of the treaty of Campo Formio, by Camolli; the *campo santo* is one of the finest cemeteries in Europe. Udine is the see of an archbishop. The *duomo*, dedicated to the Annunciation of the Virgin, was begun 1366 by P. P. Celega (delle Masegne), retains its fine west front and Gothic portals; the choir was rebuilt by one of the Sansovinos; two side altars *circa* 1657-1700 by L. Pozzo; and D. de Rossi was employed *circa* 1720 (SELVATICO, *Archit. in Venezia*, 8vo., Ven., 1847, p. 123). The campanile, octagon on plan, dating from XII cent., was rebuilt 1442 by Cristoforo da Milano. There are ten or twelve parish churches; the *loggia* and church of S. Giovanni 1533; and the church of S. Jacopo, are by Bernardino da Udine. The *façade* of that of S. Antonio, the altarpiece in the Madonna della Grazie, and the small church of Santo Spirito, are all three by G. Massari, *circa* 1726-43; S. Pietro Martire is also mentioned for notice. There are also numerous chapels; a large episcopal and other palazzi; the house of G. da Udine, with stucco decorations probably by himself; a good theatre, of which the interior was arranged 1795 by A. Mauro, and 1824 redecorated by G. Borsato; a grand *palazzo pubblico*, called "il castello", begun 1519 by G. Fontana, and continued 1547 by A. Palladio, and later a penitentiary; a guard-house with *torre dell' orologio*, *circa* 1487-1564 by G. Ricamatore (G. da Udine), who decorated the *piazza Contarena*; with other usual public buildings. A filtering tank (*wasser-seite*) by Presani, is given in ALLG. BAUZEITUNG, 1842, pl. 436. MANIAGO, *Guida d' Udine*, 8vo., San Vito, 1839, p. 27, etc.; and *Storia—Friulani*, 8vo., Udine, 1823. RINALDIS, *Pittura Friulana*, 8vo., Udine, 1796. FREEMAN, *Neighbour Lands of Venice*, 8vo., 1881, 14. 26. 28. 50. 96.

UDINE (BERNARDINO DA), a relative and pupil of Giovanni Ricamatore, and whose daughter he married in 1535. MANIAGO, *Storia—Friulani*, 8vo., Udine, 1823, states he had in 1525 built the *façade* of the church at S. Jacopo, and was called "Mistro Bernardo tajapiera proto de la fabrica". He also, p. 155, 389-1, states that he built the fine *loggia* (also ascribed to Giovanni) and church of S. Giovanni, giving the model, Nov. 3, 1533, to the wardens, who accepted the design, slightly altering that of the church; he was paid five ducats a month and two ducats for the model. He died probably about 1540. 68.

UDINE (GIOVANNI DA), G. de' Nanni; see RICAMATORE (G.).

UDINE (ANGELO, and LEONARDO DA), were about 1550 practising at Udine. MANIAGO, *Belle Arti Friulane*, 8vo., Udine, 1823, p. 153.

UEBERLINGEN (meister LORENZ von), 1505 erected the middle tower of the *dom* at Colmar. 92.

UFER. See UPHER.

UGGERI (abbé ANGELO), of Milan, born 1788 at Rome, where, as in other cities of Italy, he designed many palazzi and houses, in the classic manner of Rome. 1836 he was elected a member of the academy of S. Luca. Published *Giornate pittoresche degli Edifici antiche di Roma*, etc., 5 vols.; *Tivoli et Tusculum; Ornenens d'architecture; les Trois Ordres*, etc., 12 vols., obl. fol., 1800-1819. *Della Basilica di S. Paolo sulla via Ostiense*, 4to., 1823. *Della Basilica Ulpia nel Foro Trajano*, etc., fol. (Rome, 1840?). *Intorno agli Edifici di Trajano*. 68.

UGOLINO (MATTEO DI M.) of Siena, was 1350 architect on the *duomo* of Orvieto. 67.

UGOLINO. Of Florence, the father of Fra ... BORGHESI (born 1252, died 1313). 87.

UJJAIN. See OOOJIN, in Hindostan.

ULIN (NICHOLAS D'); see DULIN or Dullin.

ULM. A city of Württemberg, situated on the river Danube, over which are bridges to "Neu Ulm", in Bavaria, and on the river Blau, over which are five bridges. It is a place of considerable strength, having been fortified since 1842 with twelve detached forts and a citadel. There are a few old houses left in the narrow winding streets. The portal for the Frauenthor 1622-3 is by Peter Held, continued by D. Schopf of Isny. The *dom*, now protestant cathedral, dedicated to All Saints, a large and lofty Gothic structure, one of the six finest in Germany, was erected entirely at the cost of the citizens. The choir and nave are partly of brick, as is the tower, which has stone set-offs, strings and niches. The nave has five aisles; the choir with a five-sided apse has only chapels; one large western tower unfinished, with a *vorhalle*. There is no triforium and only a small clearstory; no rood-screen. The first stone was laid on Tuesday, 30 June 1377, at south-west of entrance hall. The following is a list of the *baumeister*:—1378 meister Heinrich and Michel. 1390 Ulrich Ensinger (died 1429) who 1420 contracted for five years for the tower (supposed the same as Ulrich von Frissengen). 1427 Caspar *steinmetz*, and Matthias, his sons, and Moritz, son of Matthias. 1430 Mattheus Ensinger, another son, worked 1452 at the tower, (and 1451 is over the *choir-arch*); he died 1463 and his effigy is on the tower. 1470 a son Mauricius contracted 1469 to complete the windows and middle vaulting (worked till 1480). 1474-92 Matthew Boeblinger of Esslingen; tower subsided. 1492 Hans Gugelin. 1492 to 1502 Burkhardt Engelberger (died 1512) strengthened the piers of the tower which is supposed completed as at present. 1496-1505 Stephen Wird. 1502 L. Aeltin or Aeltlin of Kellheim put up the shafts dividing the aisles. B. Winkler; and later, Dionysius Boeblinger; Hans von Frankfurt; Jerg von Hall; Lienhard of Amberg; M. Mader of Berlin. Building completed 1507, though usually stated 1478. 1516 Marx *steinmetz*. 1622 P. Held, *steinmetz*. 1690 H. Hacker. Georg Surlin or Joerg Sýrlin, sen., 1458 did the singing-desk, 1468 the three precentor stalls in the middle of the *choir-arch*, and the eighty-nine stalls 1469-74. The pulpit by B. Engelberger; Joerg Surlin, jun., 1510 carved the sounding-board. The glass 1480 and later is by Cramer and Hans Wild. The tabernacle, 1469 by a meister from Weingarten, is 90 ft. high. There are some good brasses of XIV century.

The church is 455 ft. long externally; 391 ft. long internally, and nave 146 ft. high, 47½ ft. wide; or 416 Ger. ft. by 166 ft. wide and 141 ft. high (144 ft. Engl.) including the thickness of the stone vaulting. The four aisles 70 ft. 6 ins. high; the choir 90 ft. high; the tower, now 237 ft. Ger. or 334 ft., was to have been 495 ft., 475 ft. Rhenish, high (or 316 ft. 9 ins. Engl.), and to have been 491 Germ. ft., was stopped by the settlement of the two piers on the side next the church. The two eastern turrets were to be 282 ft. high. In 1844 and 1851 a restoration projected under ... Thränn; and in 1854 the tower was proposed to be carried up to 520 ft.; BUILDER *Journal*, 1854, xii, 6; xiii, 542; 1883, xlix, 173, with interior, and 208 exterior of choir; 668, exterior and tower as proposed for completion. ARCHEO. AND ART SOCIETY IN SWABIA, *Transactions*, 1855. F. H. von DER HAGEN, *Briefe aus der Heimath*. FRIK, *Beschreibung des Münsters zu Ulm*, 4to., Ulm, 1777, p. 12. KING, *Medieval Architecture and Art*, 4to., 1858-68, iv, gives 8 plates. PRESSEL, *Ulm und sein Münster*, 8vo., Ulm, 1877. EGLE, *Münster zu Ulm*, 45 pl., fol. (1870). MAUCH, *Archit. und Orn. aus den Münster zu Ulm*, 5 pl. of stalls, 1843. MÖLLER, *Denkmäler der Deutschen Baukunst*, 2 vols., fol., 1821; 1836; 1840, gives pl. 57-8, the tower from an original parchment drawing, ten feet long. LEEDS, *Möller's Memorials*, 8vo., London, 1824; 1836, p. 77-84. The church and convent of the Franciscans; KING, gives one plate. Trinity church from 1617-31; a Roman Catholic church, and a modern synagogue. The "mount of olives" begun 1492 by M. Boeblinger was taken down 1807.

A palace in which one of the princes of Württemberg resided. A deanery. The *deutschordenshaus* before 1226, greatly repaired 1712-18, by J. G. Strampfer, is a good Italian design. The

brechhaus at the Granzthor 1634, by J. Furtenbach, who also designed the *brunnenwerk* in the Seelengraben 1638; *Combodienhaus* 1641; the German school in the Eich; and a private house for himself, restored 1790 by J. K. Kienlin; the *rathhaus*, Gothic 1370, not handsome (said to be XVI cent. transition to renaissance); the *kornhaus* and market buildings; the *Elhingerhaus* or *neubronnerhaus*, now the industrial museum, 1603 on site of a palace of Charlemagne; the commandery of the Teutonic order, 1712-18 on site of a habitation of the order, of XIII cent.; the *fischkasten* or stone fountain in market-place, a triangular Gothic obelisk, 1482 by Jörgo Syrlin, sen.; a theatre: courts of law, are noticeable erections. PROUT, *Facsimiles of Sketches in Flanders and Germany*, fol. (1837?). GRÜNEISEN and MAUCH, *Ulm's Kunstleben im Mittelalter*, 8vo., Ulm, 1840; 1854. SCHMIDT, *Chronicles of Ulm* (if published after 1836). WEBB, *Continental Ecclesiology*, 8vo., 1848. 14. 28. 50. 92.

ULM. See HANS von Ulm; and HANS FELBER. 17.

ULMUS. The Elm. This tree, naturalised in the times of the Heptarchy, has given Saxon names to many villages, as Elmham, Elmwood, Elmsthorpe, Elmstead, and Elmsley. "Elmyu borde" is mentioned temp. Edward IV. All the species are trees; they are of easy cultivation, and readily and rapidly grow in almost any soil or situation, some of them attaining great size and age. They bear transplantation well, and almost at any age; and endure a smoky atmosphere. They are very subject to ulceration, generally at three or four feet from the ground; and also to a deposit of cambium between the wood and the bark. During growth numerous insects feed and live on the elm: as the *Scolytus destructor*, a little beetle which attacks young elms and destroys whole forests. At eighty years the trunks become hollow, the arms and roots brittle; the tree itself might be in perfect health as looked at from the outside; but during great heat and drought the branches are exceedingly liable to fall without the slightest notice or warning even in the calmest weather; *BUILDING NEWS Journal*, 1870, xix, 58.

ULMUS CAMPESTRIS, Common English, or Small-leaved elm. It appears to have been known to the ancient Greeks; and is still common in Italy; in England from a very early time; in France, it was introduced 1540 in public walks by Francis I; and was sent into Spain by Philip II of Spain during the reign of Mary, for forming avenues at Madrid, the Escorial, Aranjuez, etc. In its greatest perfection and beauty, it is seen in the southern and middle parts of England; it is extensively employed for forming avenues for public walks and drives near towns; planted in parks and around the larger mansions; it grows rapidly and obtains a height of 60 to 70 feet, with a trunk of 7 to 8 ft. circumference: and from 70 to 90 ft. high at an age of about a hundred years; several examples are given in LOUDON, *Arb. et Frut. Brit.*, 8vo., 1838, iii, 1379; and in PENNY CYCLOPEDIA, 1843, xxv, 492. A balk was obtained in 1863, 33 ft. long, about 4 ft. thick, which weighed about 18 tons; *BUILDER Journal*, xxi, 251. The mean size is put at 44 ft. long and 32 ins. diam. by HASSENFRATZ.

It is recommended that the timber be felled between 1st November and end of February. The heart wood is of a brown colour, having a green shade; hard and fine-grained, free from knots; porous and cross-grained. Its durability is increased by being kept constantly moist; and it should be cut many years before it is used, otherwise it is very apt to shrink or warp. It is not liable to split, and bears the driving of nails and bolts better than any other timber. Having all these qualities it is used extensively in ship-building; also for piles (as under old London bridge), for pumps, water-pipes, coffins, troughs, conduits, water-wheels, sluice-gates, and such-like purposes. Under other circumstances it decays rather rapidly, so only fresh-cut logs should be selected. Two trees in very good preservation were found in 1837, 15 ft. underground, opposite the church of S. Giles-in-the-fields, London. The wood is sometimes stained by cabinet-makers to look like mahogany. The sap is generally 1½ to 3 ins. thick. The wood loses much in drying; a cubic

ARCH. PUB. SOC.

foot weighing 70 lbs. is only 28 lbs. (SELBY) when dry; or 48½ lbs. (LOUDON); 36 lbs. (BREES); from 34 to 37 lbs., and seasoned from 36 to 50 lbs. (TREDGOLD). The cohesive force of a square inch varies from 6,070 to 13,200 lbs.; the weight of its modulus of elasticity for a square inch is about 1,343,000 lbs. If the strength of oak be put at 100, elm is 82; stiffness, 78; toughness, 86. According to CROUCH, elm shrinks one forty-fourth part of its width in seasoning (TREDGOLD). The transverse stress of a piece 2 × 2 × 84 ins. was 393 lbs. to break; tensile stress 2 × 2 × 30 ins. was 22,140 lbs. to break; and to crush a 2 in. cube, an average of 10-333 tons (LASLETT).

ULMUS CAMPESTRIS has eighteen or more varieties:—

- U. c. vulgaris; wood of inferior quality; north of England.
 - U. c. alba; good timber.
 - U. c. acutifolia; good timber; Norfolk and Suffolk.
 - U. c. virens; almost evergreen; delicate; called the Kidbrook elm.
 - U. c. cornubiensis, or stricta; Cornish elm; lofty; 90 ft. high at 70 years old in Bagshot park.
- Several others are planted as ornamental or curious trees.
- U. SUEHROSA, Cork-barked elm, the bark being deeply fissured; England and Scotland; lately in Ireland; the Continent also; timber of less value than U. campestris.
 - U. MAJOR, Greater, or Dutch Cork-barked elm, or Sand elm. A more graceful-looking tree than the last, with larger leaves. Brought from Holland to England by king William III, and planted in the old part of Kensington gardens. Timber of inferior quality, as it is more subject to star-shakes.
 - U. EFFUSA, Spreading-branched elm. A native of Russia, where it attains a great size. The wood is hard and durable.
 - U. MONTANA, Mountain, Scotch, or Wych elm. A British species; more abundant in Scotland and northern parts of England; also in Ireland. There are many varieties. It is a handsomer tree than U. campestris; smoother bark; leaves larger; the boughs droop and do not grow low down on the stem. The timber is light brown and apparently varies, as some writers do not consider it so valuable as that of the English elm, while others prefer it for carpentry and shipwork: it is very flexible when steamed; tough and moderately hard when seasoned. One tree was 17 ft. circumference and 120 ft. high, and computed to weigh 97 tons when felled.
 - U. GLABRA, Smooth-leaved elm. A native of Britain, especially in Essex. One of the most rapid-growing trees of the genus, and more upright tree than U. montana; timber excellent. The Scampton elm is a variety; common in Yorkshire and Nottinghamshire; of rapid growth, but the trunk becomes rotten at the heart sooner than most of the varieties.

The American species are:

- U. AMERICANA, American elm, or White elm; New England to the Carolinas; 80 to 100 ft. high. It was brought to Europe about 1752.

The elm at Boston Common, supposed in existence before the settlement (1783), was when blown down 15 Feb. 1876, 22 ft. circumference. Some fine trees are in the gardens at Trianon, in France. Timber used as the English elm in Europe.

- U. FULVA, Slippery elm, or Red elm from the timber being of a darker colour than, and not so good as, the last species.

- U. ALATA, Wahoo or Cork-winged elm. Small tree and only grown for its singular branches.

The Canada Rock elm gives logs 20 to 40 ft. long and 11 to 16 ins. square; of a whitish brown colour; the sap is perishable. In bulk or plank it is very liable to split if exposed to a dry current of air; and is subject to other defects. LASLETT's experiments show it to be superior to the English elm.

CORDIA gerascanthus, Spanish elm, and Princes wood, is a native of Jamaica.

Besides LOUDON above mentioned, are: GILPIN, *Forest Scenery*, 8vo., cir. 1808. SELBY, *British Forest Trees*, 8vo., 1842. MICHAUX, *N. American Sylva*, 8vo., Phil., 1817-19; new edit., 1850. TREDGOLD, *Elementary Principles of Carpentry*, 4to., 4th edit., 1853. LINDLEY, *Synopsis of British Flora*, 3rd edit., 8vo., 1859. LASLETT, *Timber and Timber Trees*, 8vo., 1875.

ULNA. A measure equal to 5 feet, or 5 ells a perch; *Cotton*, *Galba E. iv.*, fol. 28 b; (? XIV cent.). The length of a man's arm; ell, the length of two arms stretched out. ELL. PERCH.

ULNAR ARCH. A term given by MURPHY, *Batalha*, fol., 1795, intro. 8, to the depressed arch seen in Elkstone church Gloucestershire, and who appears to think it was formed as now

seen; BRITTON, *Arch. Dict.*, 8vo., 1838, p. 53 and pl. A partly flat and arched head in a balustrade of XIII cent. is shown in VIOLET-LE-DUC, *Dict.*, 8vo., 1856, ii, p. 71, 72.

ULPIA TRAJANA. The site of this Dacian relic has been found at Varkely; *TIMES Newspaper*, 28 June 1881. TRAJAN.

ULRIC and ALBERT are mentioned as *ingeniarii*, in the reigns of kings Henry III, Richard, and Edward I (1216-1307).

ULRICO da Fillengen di Ulm; see FRISSENGER and EXSINGER (U. von), in CICOGNARA, *Storia*, fol., Venice, 1813, i, 224.

ULSBERGER (JEAN THOMAS), or Ulsperger, lived early in XVII cent., measured the height of the tower of Strassburg cathedral, and found it to be 489 ft. 8 ins. In 1654 it was struck by lightning, Heckler rebuilt it 1 ft. 10½ ins. higher; and is now 491 ft. 6½ ins. GRANDIDIER, *Essais sur l'église*, 8vo., Stras., 1782, p. 228, 230.

ULTRAMARINE (Outremer, lazuline, lazuline blue, *Laazurstein*; from the beginning of XVI cent., imported as *azurum ultramarium*). A magnificent blue pigment, consisting of about 36 of silica, 36 alumina, 24 soda, and 3 sulphur. The genuine sort is the product of the LAPIS LAZULI, a Siberian mineral of great beauty, by pounding, washing, and separation. The finest qualities of this colour are exceedingly costly (some being valued at twenty guineas an ounce), but the artificial product can be sold at a wholesale price of fifteen pence per pound (1851). The *cyanus* of the ancients. German chemists consider the colouring principle to be sulphuret of sodium; it is pure in tint but varies in tone, transparent in shade, dries and works well in oil; is useful in fresco and siliceous painting. Mingles well with blacks, greens, and greys, and reds for purple. Thoroughly permanent for all usual artistic purposes; hydrochloric acid, or citric or other weak acid decomposes it, so any acid pigments, as impure Constant white, should not be used with it. It is often adulterated with sulphates of baryta and lime. It does not blacken with white-lead. Winsor and Newton's "Genuine Ultramarine" is noticed in *Art Journal*, 1862, p. 162.

The first manufacture of Factitious or artificial ultramarine, is ascribed (THEOPHRASTUS) to a monarch of Egypt. It is called French, Dutch, Metz, bleu de Garance, Gmelin's (of Tübingen) blue; and Outremer de Guimet dating from about 1814, which last is also called Prussian blue and the manufacture of which remains a secret (Jurors' reports, Exhibition of 1851). The large factory of Zeltner and Heyne at Nuremberg, is described in *BUILDER Journal*, 1856, xiv, 149. Silicate of alumina, silicate of soda, with sulphide of sodium, usually compose this useful artificial pigment, which when well made can be safely used in place of the native variety; it is permanent, the most desirable are those possessing the most colour; as a rule it is darker and less azure than the native pigment. Strong heat, however, turns it to dingy blue and finally white; and like the native variety it is decomposed by ignition in hydrogen gas. In water, it should be used with a gun free from acid. The poorer variety blackens with white-lead. 14.

ULTRAMARINE ASH. Blue ash is the product obtained from the last grinding of the lapis lazuli. It is an impure coloured ultramarine; of a pale warm azure, affording greys much purer than such as are composed of black and white, or other blues. The inferior ash furnishes "mineral gray". CENDRES BLEUES.

ULZ (JOHANN). The same as HILTZ (HANS). 92.

UMBALLA; properly Ambala. A city in the Punjab, in Hindostan, founded in about XIV cent. The English church, designed by capt. G. F. Atkinson, R.E., was at the time considered the handsomest in the Punjab; the nave is 117 ft. by 30 ft., chancel 50 ft. by 26 ft.; *BUILDER Journal*, 1856, xiv, 359; *ILLUSTRATED LONDON NEWS*, 1856, xxix, 499. HUNTER, *Imperial Gaz. of India*, 8vo., 1885, i.

UMBER. Raw umber is a fossil brown substance, a natural ochre, said to have been first obtained from Umbria, in Italy. Cyprus or Turkish umber is considered the best. It is also found in England and Turkey and elsewhere. It consists of 48 oxide of

iron, 20 oxide of manganese, 13 silica, 5 alumina, and 14 water. It is of a brown citrine colour, semi-opaque, has all the properties of good ochre; is perfectly durable in water and oil; and is one of the best drying colours. It injures no other good pigment with which it may be mixed. It is not so much used as formerly except in ordinary house-painting, and in graining. CITRINE. REDDLE and RUDDLE. 9.

Burnt umber (old Ital. name *falsato*) is raw umber burnt, by which it becomes of a deeper and more russet hue. It contains manganese and iron; is very drying in oil, in which it is employed as a dryer; and is a perfectly durable pigment in water, oil, and fresco. In 1858, the largest quantity of ochre and umber was shipped from Truro; and a small quantity of Halloon, Indian queen's umber; also shipped from Newton Abbot; (Bideford mineral paint); Oxford ochre, from the Shotover hills; a large quantity from Anglesea; Isle of Man; and a small quantity from Yorkshire. 9. 13.

UMBO. The same as AMBO.

UMBRACULUM. The same as CIBORIUM; BALDACHINO; UMBRELLA.

UMBRATILE. The term given to work, such as the order of pilasters and panels in the second story of the interior of the Pantheon at Rome, which is entirely encrusted with coloured marbles opposed to each other without any projections; these incrustations are embellished with all the art and labour that can be bestowed upon them; ELMES, *Lectures*, 8vo., 1821, p. 282.

UMBRELLA. In eastern countries from the earliest times the umbrella was one of the insignia of royalty and power. The tree of the Hindoo tomb is an umbrella. BALDACHINO.

UMBRELLO. A term used for a covered seat in a garden; as in LANGLEY, *Gothic Architecture Improved* (1741-2), 4to., 1747, pl. 31, 49-55.

UMÉ (G...). He designed 1851-53, the romanesque chapel in the park of the castle of Argenteau, in Belgium, in memory of a count Mercy, Austrian ambassador at the English court; Château de Ry, province de Namur (pl. 76-8); Maison rue Méan, at Liège (pl. 97); and Société Littéraire, at Liège (pl. 100-1), of CASTERMANS, *Parallèle des Maisons de Bruxelles*, fol., Paris, 1856.

UMGHYER or Mughyer. A structure near Arjah or Arria, 80 ft. or two stories high, with a large mound of rubbish at the base, like the Birs Nimroud; it is 87 by 47, or 59 by 39 paces; say 60 by 40 yards square; FRASER, *Kowrdistan*, 8vo., 1840, ii, 90. LOTUS, *Chaldeæ and Susiana*, 8vo., 1857, which gives cuts. It is the site of the ancient Chaldean city of UR.

UMMERAPOORA; and Amrapoora. See AMARAPURA, in Birma.

UMPIRE, UMPIRAGE. The person appointed by two arbitrators when they differ to decide the matter referred. His decision is properly an "umpirage", while that of arbitrators is an "award". His appointment, unless made in the submission, should be signed by both arbitrators together: he should formally accept the office: his award must be made, unless a time be fixed in the submission, within three months of his entering on the reference; there are however always modes of enlarging the time. His powers commence when the arbitrators disagree or agree to differ; he must, unless it is otherwise agreed, hear the whole case; and must decide between the parties, not merely between the arbitrators; he must take all evidence tendered, but if appointed as an expert, he may decide technical questions without hearing evidence upon them. A lay umpire is entitled to have a legal adviser to sit with him during the reference: he is "*functus officio*" when he has made his award; his award must be stamped as an award, not as a valuation. The court may remit the matters referred to his re-consideration and re-determination, when all his powers revive. An umpire has no power to award costs unless given him in the submission, but if the power is given him, he may be called on to decide the scale on which they are to be taxed. The costs in a cause if so referred may be part of his award.

The 17 and 18 Vict., c. 125, the Common Law Procedure Act 1854, was commonly referred to in submissions, and this act, together with the 36 and 37 Vict., c. 66, and 47 and 48 Vict., c. 61, the Judicature Acts of 1873 and of 1884, regulated most of the points above referred to. The 52 and 53 Vict., c. 49 (1889), Act for amending and consolidating the enactments relating to arbitration, alters much of the procedure hitherto in use. LYNCH, *Redress by Arbitration*, 1888. WATSON, *Law of Arbitration and Awards*, 8vo., 3rd edit., 1846. RUSSELL, *The Power and Duty of an Arbitrator*, 8vo., 6th edit., 1882. ARBITRATION. AWARD. CONTRACT.

T. M. R.

UMRAVATEE, Amaraṭi, Oomrawti, now AMRAYATI. A town in the district of Kitna, Madras presidency, situated on the river Kistna. One of the centres of the Buddhist kingdom of Vengi; and has a fine *tope* of the IV cent. A.D., first examined in 1797; and later, portions of the sculptures, processional circle and *daghoba*, were sent to England; they are now placed on the main staircase at the British museum. FINLAYSON, *Mission to Siam* in 1821-22, 8vo., 1826, p. 221. FERGUSON, *Tree and Serpent Worship*, 8vo., and fol. plates, 1868; and his *Eastern and Indian Architecture*, 8vo., 1876. *The Tope*, in BUILDER *Journal*, 1880, xxxix, 199. BURGESS, *Amaraṭi stupa*, 4to., Madras, 1882. SEWELL, *Report, and Excavations in 1877*.

UMRITSA, Umrizter, and Amritsar. The religious capital of the Sikhs, in the Punjab, founded 1574 on the site granted by the emperor Akbar, around a sacred tank, in the middle of which was erected a temple. In 1761 it was blown up and defiled. In 1802 Ranjit Singh seized the town, spent large sums on this "monotheistic place of prayer", roofing it with sheets of copper gilt. It is now known as "the Golden temple", and darbar Sahib. Many of the inlaid decorations were taken from the tombs of Jahangir and Nurjehan at Lahore, and other monuments. The gateway and marble causeway are given in colours in the ILLUSTRATED LONDON NEWS, 1858 (?), from a drawing by W. Carpenter, jun.; also Akalis tower, and the Sikh temple and tank, xxxii, 438, 471. HUNTER, *Imp. Gaz. of India*, 8vo., 1885, i. FERGUSON, *Eastern, etc., Architecture*, 8vo., 1876, p. 468. ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1888, iv, 127.

UNBERTIUS (or Unbertus) me fecit. An inscription on two caps of XII cent. columns in the entrance porch to the abbey church of S. Benoît sur Loire, given in GAILLHABAUD, *Arch. du Vme.*, 4to., Paris, 1858, i, p. 5 of text.

UNBURNT BRICK. "Till the first century B.C. only unburnt bricks appear to have been used in Rome, and no example of brick earlier than the time of Julius Caesar is now to be seen in the city. Strange to say, the remarks of VITRUVIUS, 2, viii, on the subject of bricks for walls do not apply to any which now exist in Rome, as he only mentions rectangular bricks, while those used in existing walls are invariably triangular in shape. It is most probable that he is referring to *lateres crudi*, sun-baked bricks, of which no example in Rome now remains, though they must once have been very common. These unfired bricks lasted perfectly well as long as they were covered with stucco to protect them from the rain.—Recent discoveries have shown that this system of building—was very common among the Greeks for many centuries: for example, the upper part of the great wall round Athens, which was destroyed by Sulla; the prehistoric houses of Hissarlik, Mycenae, and Tiryns"; MIDDLETON, *Methods of Construction in Ancient Rome*, in ARCHEOLOGIA, 1888, II, p. 52. ADOBE (Arab. *at-tob*; *tobî*); SUN-DRIED BRICK. SIMPSON, *Mud Architecture*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, iii, 1887, p. 57. LIMA. PERU.

The use in cottages, of unburnt bricks for filling in between studs and boarding inside and outside, is described by DOWNING, *Country-houses*, 8vo., New York, 1850, p. 55-7.

UNCKEL-BRUCH. A quarry from which stone was obtained for the older portions of Cologne cathedral. COLOGNE.

UNCOURSSED RUBBLE WORK (Gr. *incertum opus*); also called SNECKED RUBBLE. See RUBBLE; and MASONRY. Two

"throughs" per square yard is the general practice in construction; and the walls are sometimes lined with brickwork inside to keep out the wet. Walls under 2 ft. 6 ins. thick are usually taken at yards super, and those of 2 ft. 6 ins. or above, at yards cube.

UNCTUARIUM, written unctorium, in PLINY, *Ep.*, ii, 17. The apartment in ancient thermæ in which the bathers were anointed after leaving the water. It was also called ALEIPTERION and ELÆOTHESIUM.

UNDA. A term used in VITRUVIUS, v, 7, who referring to the *scena*, describes that the upper pedestal including the base (*unda*) and cornice (*corona*) is to be half the height of the lower pedestal.

UNDERCROFT. The same as CRYPT. A subterraneous apartment. The Black Prince, died 8 June 1377, in his will, desired to be buried at Canterbury, "en mylieu de la chapelle de Notre Dame Undercrofte". The church of S. Faith, begun 1257, under old S. Paul's cathedral, was termed "ecclesia Sanctæ Fidis in cryptis"—"this undercroft, as these sort of buildings were called"; PENNANT, *London*, 4to., 1793, p. 379. Under the great window in the north transept of S. Mary Witney, Oxfordshire, are the remains of a crypt, and similar undercrofts exist at S. John, Burford, below the south aisle; at Dorchester abbey; and elsewhere in the county; PITE, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1883-84, p. 234. NICHOLS, *Pilgrimages to Walsingham and Canterbury*, 8vo., 1849 and 1875, by "Desiderius Erasmus".

The duomo at Milan was of a uniform level until Pellegrini raised the choir, for S. Carlo Borromeo, and constructed an undercroft or *chiesa hiemale*. At S. Eustorgio, the eastern part is raised on a crypt the floor of which is on a level with the nave, so that the choir is quite concealed from sight. CONFESSION.

UNDERCUT. When a work, as a figure or group of figures, stands out from the ground, or foliage or drapery has to be well relieved, the material has to be cut out at the back to give the full form; this is undercutting. In making moulds for casting, they have to be made in smaller pieces, or the ground be cut away afterwards, to get the true effect of the original.

UNDERDRAW. A term belonging to plasterers' work. In Yorkshire and some parts of Leicestershire; roofs when lathed and plastered either against the rafters, or as a flat ceiling; also floors when ceiled for the rooms below; are termed "underdrawn". Thus, "beautifying this chancel; which after repairing the roof, underdrawing the ceiling, sashing all the windows, and raising the floor, was finished in the year 1770"; HUNTER, *South Yorkshire*, fol. 1828-31, ii, 443.

UNDERPIN and underset (Fr. *sous œuvrer*; see *épaule* and *chevalement* in 5 and 25). The following references are in addition to those mentioned s.v. NEEDLING, and SHORE-UP. To bring up a wall of brick or stone, to the ground sill. Also the work itself when done. The temporary support of a wall, whose lower part or foundations are defective; also the bringing up new solid work whereon it is to rest in future. ("Gouging a foundation", is the Scotch term, signifying a mode of securing an unsound wall by driving wedges under the footings.) The bricklayer, or mason, cuts the holes for needling, to remove old work; to bring up new work in cement on concrete foundation; and finally drives in cast-iron wedges for bringing the old work to a solid bearing. Small work is pinned up with tiles or slates in cement. KERR, *The Consulting Architect*, 8vo., 1886, p. 109, remarks, that "Under no circumstances ought the underpinning of a wall to be taken only partly through its thickness. This is far too frequently attempted, or when carelessly supervised, done as a matter of course, even by good bricklayers." 1. 2. 4.

Bortolo di Alessandro, called Il Manopola, is stated to have invented the system of supporting a building while the foundations are being taken out and replaced, as in 1602-15 at the ducal palace at Venice. The manner of restoring three Norman columns in Colne church, Yorkshire, in 1815, is related in WHITAKER, *Whalley*, 4th edit., 1876, ii, 253.

UNDERPITCH or **WELSH GROUT**. When the transverse vaults are smaller and lower than the main or body vault, they are thus called, but the reason why the latter term is applied is unknown. One of the best mediæval examples of this character of vaulting is at S. George's chapel, at Windsor. NICHOLSON, *Carpenter's New Guide*, 4to., 1801, 3rd edit., 28.

UNDERSSET. The term in Yorkshire for **UNDERPIN**; ASSOCIATED SOCIETIES, *Reports and Papers*, 1873, p. 94. The term is explained with diagram, in BRES, *Glossary*, for the supporting earth in a cutting when situated beneath rock. The stone is laid in courses against the face of the earth or softer soil, the rock above being finished as nearly perpendicular as considered safe and convenient to work. The great Blisworth cutting on the London and North Western railway is a good specimen of this description of work. **SHORE**.

UNDERSHOT WHEEL. A water-wheel with a number of flat boards, which receive the impulse of the water conveyed to the lowest part of the wheel by an inclined canal.

UNDERSPORE. To heave up, by putting a pole or lever underneath. 4.

UNDERSUNK FOUNDATION. In riverside construction, water-tight cylinders of wood or iron are sunk through loose or wet ground, to sustain the earth laterally, and to dam back the water. The cylinders are of sufficient diameter for men to work inside them. When sunk to the greatest depth possible, if it be then necessary to carry the permanent brickwork deeper, to form the foundation of a future wall, the underpinning below the curb of the cylinder is called the undersunk foundation. R. R. R.

UNDERTAKER (It. *imprenditore*; Sp. *empresedor*; Ger. *übernehmer*; Fr. *entrepreneur*). Now called **CONTRACTOR**, under which term some examples of its use in 1766, 1784, are given. 1290; R. de Uppenhall, the undertaker, in erecting the cloister at Norwich cathedral from the north-east angle for bishop Ralph de Walpole; and added three more arches, laying a stone in the wall showing he was the founder (INCEPTOR) of them. 1598; The second court of S. John's college, Cambridge, was "put into the hands of two undertakers, Wigge and Symons (a way of building not so allowable in works intended for posterity), who for £3,400" were to do the work in four years; WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., 1886, ii, 249. 1680-82; St. John's church, Dublin, was rebuilt by Samuel Rothery and Michael Cook, the undertakers of the building; GILBERT, *Dublin*, 8vo., Dublin, 1854, i, 51. *Account of the Frauds and Abuses at Dagenham Breach*; and of the Hardships sustain'd by W. Boswell, late Undertaker of the Works there, 12mo., 1717. The term was used in the contract for the erection 1754 of the Royal Exchange in Edinburgh, where it includes as well the tradesmen as the architect who were jointly responsible under the contract.

UNDERWOOD (HENRY JONES), a pupil of sir Robert Smirke, practised at Oxford, where 1833 he designed S. John Baptist church, Summertown (Early English), cost £1,600 (an enlarged chancel, open seats, vestry, etc., were added 1854 by G. E. Street; ECCLESIOLOGIST *Journal*, xii, 147); 1835 the porter's lodge, new library, and lecture room, at the botanic gardens; 1836 S. Paul in Jericho (Greek) with J. Johnson; the chapels in each of the three cemeteries, of which he published *Working Drawings*, fol., 1850; designed S. Mary and S. Nicolas church at Littlemore for Dr. Newman, published in *Working Drawings*, fol., 1840 (ECCLESIOLOGIST *Journal*, 1849, vi, 117-126); the church at Littleworth, Berkshire; besides several parsonage houses near Henley-on-Thames, including Medmenham and Remenham. He was getting into fair practice in that city, having made the designs for the prison and asylum (carried out by J. C. Buckler), when he committed suicide 22 March 1852. E. G. Bruton was with him until his death, and completed Didcot rectory.

UNDULATED MOLDING; Undy, or Oundy. A corbel table whose under edge has a wave-like outline. **NEBULE**.

UNDULATION IN MOLDINGS. The choir, blind story,

and clerestory of Shoreham church exhibit that evenly balanced alternation of convex and concave moldings often found in the beginning of the Lancet period, the quadrate outline of their arrangement betokening also their early character. The same monotonous uniformity of undulation occurs again in the outer doorway of the south porch; as shown in SHARPE, *Chichester*, etc., 4to., 1861, p. 15 of supplemental sketch.

UNGER (GEORG), *rathsbaumeister* in Nuernberg, was also called *steinmetz*. In 1552 he built the great round towers of the Spittler, Laufer, Frauen, and Neuen, gates. He died 1559. 68.

UNGER (GEORG CHRISTIAN), born 1743 at Bayreuth, studied there under Gontard; 1763 became *bauamts conditueur* at Potsdam; and later a royal *bau inspektor*, where he arranged the gallery and built many private houses. At Berlin, the French church (begun 1703 by Gontard) was 1781 transferred to him and he designed 1781-85 the tower; 1785 added largely to the hospital of La Charité; designed the *cadettenhaus* begun by J. A. Nehring; and 1781 at Friedrichstadt designed the market towers. He died in 1812. 68.

UNICORN, The. The well-known heraldic animal, a horse or ass with a long straight spiral horn proceeding from the forehead. The belief in its existence goes back to ARISTOTLE. Used as an emblem of fortitude and chastity. Its capture is a favourite subject with the mediæval artist, and the animal is found used as a powdering for a vestment. James I was the first monarch who united the lion and unicorn heraldically, adopting the latter beast from the supporters of the arms of the Scottish sovereigns. 14.

UNIFORMITY, or **REGULARITY** in architecture, hence symmetry or conformity. It is one element of beauty amongst the many that help to make up a perfect whole. VITRUVIUS, i, 2. W. H., *On Uniformity in Architecture*, in *LOUDON, Arch. Magazine*, 8vo., 1834, i, 285. It arises where one half of an object corresponds with the other. It is first attended to in artificial productions, by rude artists, where they attempt ornament. The opposite is disparity or disproportion, which is always displeasing. Uniformity may be regular, as in the leaves of a twig; or irregular, as is often the case in windows in a façade. In this case it connects itself with variety. WHITE, *Architectural Uniformity and its Claims*, at Architectural museum; *BUILDER Journal*, 1860, xviii, 107-8; and *BUILDING NEWS Journal*, vi, 132. BOULT, *Uniformity in Building, and Sanitary Arrangement*, in *ROY. INST. OF BRIT. ARCHITECTS, Journal*, 1881-82, p. 133, 182. 25.

UNION, in Architecture. The harmony between the colours in the materials of a building. In painting, the symmetry or agreement between the several parts of a piece; this is as explained in 1736. 4.

UNION. A screw joint to unite a pipe with a cistern, where soldering cannot be applied. Also to unite two lengths of pipe for removal if necessary.

UNION WORKHOUSE. A building erected and supported by a union of parishes formed under the new poor-law of 1834. One of the first was that of the Windsor union, described in the *PENNY MAGAZINE*, 8vo., 1841, x, 397. **POORHOUSE**. **SPITAL**.

UNITED STATES OF AMERICA. MICHAUX, *N. Amer. Sylva*, 8vo., Phil., 1817-9; new edition by Nuttall, 1850. HINTON, *History and Topog. of the U.S.*, 4to., London, 1830-32. DUNLAP, *History of Arch. in U.S.*, 8vo., New York, 1834. STEVENSON, *Building Materials*, read before the ROY. SCOT. SOCIETY OF ARTS, 1841; printed in *CIVIL ENGINEER, ETC., JOURNAL*, 1841, iv, 26. DOWNING, *Country Residences*, 8vo., New York, 1842; and *The Theory and Practice of Landscape Gardening*, adapted to N. America, 4th edit., 8vo., 1849. TUTHILL, *History of Arch.*, 8vo., Phil., 1848. **CUSTOM HOUSES, ETC., Illustrations and Specifications for various buildings, 8vo. and fol., Washington, 1856-7. VAUX, *Villas and Cottages*, 8vo., New York, 1857. RIPLEY AND DANA, *New Amer. Cyclopaedia*, 8vo., New York, 1861-78. ALLEN, *American Biographical Dictionary*, 8vo., Boston, 1872. *The***

Englishman's Illustrated Guide Book to the U. S. and Canada, 2nd edit. (Longmans). AMERICAN ARCHITECT AND BUILDING NEWS, 4to, Boston, 1876, in progress. SANITARY ENGINEER, 4to, New York, 1882, in progress. APPLETON, *Cyclopedia of American Biography*, 4to, New York, 1887, etc. *ENCYCLOPÆDIA BRITANNICA*, 9th edit., 1888.

UNITING METALS. See BRAZING. WELDING. SOLDERING. Various processes used by Pullrich, founder, at Hamburg, are given in CIVIL ENGINEER, ETC., *Journal*, 1848, xi, 187.

UNITY. A term applied to such objects as have one general quality pervading the whole—as of form, as in a grove of oaks; or of colour; or of sound. Unity and harmony in a work necessarily enter into that which is beautiful; a mixture of styles in any building shows a degree of incongruity and unfitness. The ancient Gothic architects had a total disregard of unity of style in their additions to previous works. The Greeks excelled in this chief beauty in architecture. BLONDEL, *Cours d'Architecture*, 8vo., Paris, 1771, i, 396. SYNCHRONISM. I. 25.

UNIVERSAL BRECCIA. See SILICEOUS and EGYPTIAN BRECCIA.

UNSLACKED or UNSLAKED LIME. Lime in lump after it has been burnt, as it leaves the kiln. 1552 "It for one bushell of vnslakte lyme to whasse ye church, xvjd."; Churchwardens' Accounts of the parish of Saxilby cum Ingleby, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1889, p. 377.

UPAPITHA. The Hindoo term for a pedestal of a pillar; and BETHISTANA, or more properly Athistana, the base. In the case when the pedestal (upapitha) is joined to the base (bethistana), the height of the pedestal may be either equal to that of the base, or twice or thrice as much. RAM RAZ, *Architecture of the Hindus*, 4to, London, 1834, p. 26.

UPERÖÖN (Gr. *ὑπερώον*). A chamber of the women's apartments, which were placed by the Greeks on the upper floor. SMITH, *Dict. Ant.*, s. v. Domus.

UPHER and ufer. A fir pole, from 4 ins. to 7 ins. diameter and from 20 to 40 ft. long, frequently hewn on the sides so as not to reduce the wain entirely. Uppers are used in scaffolding and for ladders; and in slight roofs, for which last purpose they are split. *Scotch*, caber. 1793-1802, *Builder's Price Book*, p. 20.

UPHOLD, maintain, and repair. One of the general covenants of a lease of a building. Sir William Holles, died 1590-91, and was buried at Houghton, Nottinghamshire, in the Denzil chapel, which he charged his heir "to uphold, repayre, and mayntaine"; ASSOCIATED SOCIETIES, *Reports and Papers*, 1859, p. 19.

UPJOHN (R...), of New York; designed Trinity church, (Perpendicular) 1841-46, on site of the old church in Broadway, 192 ft. long and 84 ft. wide, with a tower and spire 264 ft. high; a view is given in TUTHILL, *History of Architecture*, 8vo., Phil., 1848, p. 261; (described in *ECCLIOLOGIST Journal*, 1852, xiii, 189); an Italian villa 1845 for Edward King, of Newport, Rhode island, of which a plan and view are given in DOWNING, *Country Houses*, 8vo., New York, 1850, p. 317. A son succeeded him in the profession.

UPPENHALL (RICHARD DE), the undertaker of works 1289-99, of the cloisters at Norwich cathedral, who erected those from the north-east angle for bishop Ralph de Walpole; and also added three more arches, laying a stone in the wall with an inscription showing he was the founder (INCEPTOR) of them; BRITTON, *Norwich Cath.*, 4to., 1816, p. 33.

UPPER-CROFT. A term applied by some writers to the TRIFORM of a church; SHIPLEY, *Glossary of Eccles. Terms*, 8vo., 1872. UNDER-CROFT.

UPRIGHT. The former term for an elevation. "A platt of an upright" was given 1605-6 by sir David Coningham, as a new year's gift to James I, who gave him 12 oz. of gilt plate in return; NICHOLLS, *Progress of King James I*, 4to., 1828, i, 427, 596. "Plan and uprights" in contract 1721 for Vere street chapel; British Museum, Add. MS. 18,238, p. 376.

UPRIGHT (Fr. *début*). Another term for perpendicular. ARCH. PUB. SOC.

See restoring a work to the PERPENDICULAR. The "upright" is used in forming the clamp prepared for burning bricks. 5.

UPSALA. The former capital of Sweden, situated on the small river Fyris, over which are two stone bridges. The castle or palace, built 1538-48 by Gustavus I, burnt 1702, is in ruins except the portion occupied by the governor. About six miles distant are the *mora stones* at which the electors met 1140-1520 when choosing the king; and about three miles distant is Gamla (old) Upsala, having three tumuli, and a building, *cir.* 1118, the former cathedral, with a timber tower. The archbishopric was formed at the end of XII century. The cathedral, dedicated to S. Lawrence, was founded at end of XII cent. It is chiefly of brick with stone portals, and was commenced about 1258. In 1287 E. Bonnuell, *tailleur de pierre* at Notre Dame, set out from Paris with ten *compaignons* and ten *bachelers* to build it (Registers of the prévôt of Paris, quoted by SEROUX D'AGINCOURT, *Hist. de l'Art*, fol., Paris, 1811-23, i, 74; and PERINGSKJÖLD, *Monumenta*, fol., Stockholm, 1719, p. 18); all the upper parts of the nave, transepts, and towers by a succeeding and perhaps local architect; it was completed 1435. The sizes are given as 260 ft. Engl. by 110 ft.; others say 390 ft. long and 88 ft. high; also the interior 370 ft. by 106 to 140 ft., and choir 90 ft. high. It was much damaged by a fire in 1702 which destroyed the two north spires 400 ft. high, replaced by two 180 ft. high. It was injudiciously repaired before 1830 (HEBER, *Life*, 4to., 1830). The chapel at the east end to Gustavus Vasa (died 1560), whose tomb with three effigies was made in Flanders, was 1831-38 decorated with seven frescoes by Sandberg, a native artist; there are many good tombs by Sergel; and that of Gustavus II (died 1632) is by Per-Axel Nyström. Extensive repairs, except to the choir, were being done 1886-9 under H. Zettervall, architect; BUILDING NEWS *Journal*, 1890, lviii, gives a view, &c., by J. T. Perry. There is an old church to the Holy Trinity.

Among the public edifices are:—The governor's residence; courts of law and public offices; the university founded 1477, around the cathedral square; the central building erected 1879-87 on the site of the old archbishop's palace, for 47 professors and 850 scholars; a semicircular hall seating 2,000 persons, and a hemicyclical orchestra seating 200; eleven lecture-halls, a grand vestibule with open galleries and lighted by three large cupolas; the architect was H. T. Holmgren; a handsome library of 250,000 volumes, called *Carolina rediviva*, built 1819-41 by C. F. Sundval after a design in the Anglo-Norman style; the town house; museum and greenhouse, with a portico of the Doric order; archbishop's palace; senate house; observatory; large lunatic asylum; and the Gustavianum academy (formerly the university house), *cir.* 1680, by count N. Tessin, now the Zoological institution; there are also a large granite obelisk to Gustavus Adolphus (1612-32); and the house in which Linnaeus lived. SCHUBERT, *Reise durch Schweden*, etc., 8vo., Leipzig, 1823-4. VERNER OCH SCHROEDER, *Upsala domkyrka*, 29 pl., fol., Stock., 1826. SCHROEDER, *Upsala Domkyrka*, 8vo., Ups., 1857. J. B. ATKINSON, *Art Tour*, 8vo., 1873, p. 130. PENNY MAGAZINE, 1836, v, 373. BREMNER, *Denmark*, etc., 8vo., 1840, ii, 282; who, 327, describes Wrangels castle called Skogkloster, near Upsala. 14 15, 28, 50, 96.

UPSTART. In masonry; a stone set on end. "Inband and upstart work", are the quoinstones alternately broad and low, and narrow and high, used in Scotland, corresponding with the LONG AND SHORT WORK of Saxon masonry in England.

UR. The site of this Chaldean city is now known as Mughiar, or Mugeyer, on the west side of the river Euphrates. H. G. TOMKINS, *Life of Abraham*, read at the Victoria Institute, 16 April 1877, states: The name of Ur Casdim emerges in Scripture first as the birthplace of Terach's sons; it gave the name Ur-ma (*i.e.*, Ur-land) to the whole region of which it was the capital. "It is a curious fact", writes G. Smith, *Chaldean Account of Genesis*, "that the rise of the kingdom of Ur, *cir.* B.C. 2000 to 1850, coincides with the date generally given for the life of Abraham; there is no evidence of a northern Ur, and a

northern land of the Chaldees at this period." The city was the centre of a fruitful and cultivated district, "the only natural home of the wheat-plant," shady with palm-groves, tamarisk, acacias, and pomegranates, and irrigated with the utmost care. From the port, the "ships of Ur" set sail on the sheltered sea, which at that time reached some 120 or 130 miles higher than at present. The principal building at Ur was the temple of the Moon-god of the same name, which bears on the bricks of its lowest stage the dedication of its royal builder Uruk, probably before Abraham's time. Its huge *ziggurat*, a sacred observatory-tower of three stages, upholding the shrine, oblong in form, ascended by stairs, rose high above the buildings of the city in its northern quarter. One of the liturgical hymns to the moon-god Ur (or Sin in Semitic) actually used in this temple in the earliest times, is still preserved in Accadian and Semitic in the British Museum; LENORMANT, *Les Prem. Civilisations*, ii, 158. The walls, and at least three sacred buildings in Ur, were the work of Uruk, the great builder king; who also erected a temple to Nana or Ishtar at Erech; another to the sun-god Samas at Larsa; another to Bel, and a separate one to "Belat his Lady", at Nipur; another to "Sar-ili his king", at Ziggulla. Hea was the patron of the all-important irrigation; Sin, or Ur, of brickmaking and building; San, the sun-god (Samas), of martial activity; Nergal of hunting; and the like. BOSCAWEN, in SOCIETY OF BIBLICAL ARCHAEOLOGY, *Journal*, 10 June 1879. LOFTUS, *Chaldea and Susiana*, 8vo., 1857, p. 128. 23.

URANCQUART (GIAC. and JAC.); see FRANQUART (J.).

URBAN. The term now given in Acts of Parliament, relating to sanitary and some other regulations, to the authorities of town districts who have to carry out the provisions of those Acts; in contradistinction to "rural" applied to country districts.

URBINO (Anc. Urbinum Hortense). A town in the province of Pesaro, in central Italy; situated on an isolated hill; fortified by F. di Giorgio di Siena, and has an old castle. It was created an archbishopric in 1563. The cathedral dedicated to . . . ; several other churches, including S. Francesco with old cloisters; S. Domenico with a handsome entrance; the oratory of the Confraternità di S. Giovanni, XIV cent.; and the church of S. Bernardino near the town, with some good tombs, are to be seen. The ducal palace, now government house, at the time of its erection the finest edifice of the kind in Italy, is still in some respects without a rival, richly decorated and carved in the cinque-cento style. The STAIRCASES are very remarkable. VASARI ascribes the design to F. di G. Martini of Siena, but it was designed by L. (Benvenuto) di M. da Laurana, and completed by B. Pintelli or Pontelli 1481-90 (GAYE, *Carteggio*, 8vo., Flor., 1839, i, 274-7). F. BIANCHINI, *Spiegazione del palazzo d' Urbino*, 72 pl., insists that the principal architect was L. da Laurana; the HANDBOOK ascribes the merit of the decoration of its doors, windows, cornices, pilasters and fireplaces to Martini, assisted by Baroccio; the *tarsia* work to Giacomo of Florence. It was commenced 30 April 1456 (1447 states CLEMENTINE cited by REPOSATI; as in MORONI, *Diz. Eccles.*, 8vo., 1857, p. 203; others write 1463), for Federigo da Montefeltro, duke of Urbino, who was a knight of the garter (after Blount who died 1474), died 10 Sept. 1482; his son Guidobaldo was also a knight 1506-7, died 1508; and he finished the palace. Gir. Genga repaired it about 1500 and added a court to it (25). The palace was injured by the earthquake of 12 March 1873. ALBANI, *Memorie di Urbino*; *Plans, etc., pal. ducale*, fol., Rome, 1724. BALDI, *Desc. del palazzo ducale di Urbino*. ARNOLD, *Der herzogliche Palast von Urbino*, 50 pl., fol., Leipzig, 1856-7. The house of Raffaello Sanzio was purchased 1873 by the town assisted mainly by Morris Moore (BUILDER *Journal*, 1871, xxix, 709; 1873, xxxi, 300). The palazzo Albani. The theatre was formerly celebrated for its decorations by Gir. Genga. BALDI, *Memorie concernenti la città di Urbino*, fol., 146 pl., Rome, 1724. DENNISTOUN, *Memoirs of the Dukes of Urbino*, 1440-1630, 8vo., 1851; and *Illustrations* for the same, 33 pl., 4to., 1851.

RAMPOLDI, *Corografia dell' Italia*, 3 vols., 8vo., 1832-4. DELABORDE, *Fine Arts in France and Italy*, Paris, 1864, i, 145. MUNTZ, *Raphael*, transl. by W. ARMSTRONG, 8vo., 1882. 28. 50. 96.

URBINO (BRAMANTE LAZZARI DA); see LAZZARI (B. DA).

URBINO (RAFFAELLO DA); see SANZIO (R. DA).

URBS. The Roman term for a walled city, from the Etruscan *nava* for the furrow made by the plough in setting out the pomerium. *Civitas* was the body of *cives*, not the city. *Oppidum* the open town. At Athens, *αστυ* the old city or citadel; *πολις* the city generally. OVID, *Fasti*, iv, 819; CICERO, *De Republ.* CITY. TOWN.

URGEL. A city of Catalonia, in Spain, called La Seu (or Seo) de Urgel. The good Gothic cathedral dedicated to the Virgin, for which Raymundus *lombardus*, 1175 covenanted with the bishop for seven years undertaking to employ four *lombardos*; and if then he could not complete the work he would get four *cementarii*; VILLANUEVA, *Viaje Literario*, 8vo., Madrid, 1803-21, ix, 298-300; and STREET, *Gothic Arch. in Spain*, 8vo., 1865, p. 450-1. A. Canel 1416 was maestro mayor.

URGUB. A town in the pashalik of Karamania, in Asiatic Turkey, situated in a deep ravine, consisting of about 3,000 houses generally placed on the sides of remarkable conical and pointed hills varying from 100 ft. to 300 ft. in height pierced by caves, built of a soft pumiceous tuf and raised upon arched terraces, the roof of one serving as a court to that above, and approached by pathways cut zigzag in the rock. The castle is situated on one of the hills. TEXIER, *Asie Mineure*, fol., Paris, 1839-49, ii. "These Christian monuments," before Constantine, are shown in PULLAN AND TEXIER, *Byzantine Architecture*, fol., 1864, p. 40, pl. 4-5. HAMILTON, *Researches in Asia Minor*, 8vo., 1842, ii, 246. 50. 96.

URI (ANTONIO), of Bologna, designed in the XVII cent. the church of S. Leonardo, in that city.

URIAS (PEDRO DE). He constructed 1552 the bridge of Almaraz over the river Tagus, near Plasencia, in Spain. It is stated to be 580 ft. long, 25 ft. wide, and 134 ft. high; one arch is 150 ft. span, the other 119 ft., one pointed, the other semi-circular. The middle pier stands on a high rock; on it is a platform on which is an inscription. It was destroyed 1809 by Cuesta; and repaired 1845 by Ibanez, an ex-monk, at the expense of the locality. 3. 28. 66.

URICONIUM. The site of a Roman city at Wroxeter, near Shrewsbury, situated on the great Watling street; it appears to have been suddenly attacked. There are traces of a bridge over the river Severn. The wall on one side is 72 ft. long, 20 ft. high, 3 ft. thick, and 14 feet deep, 10 ft. of which were sunk in sand. A basilica, thermæ, houses and their contents, skeletons, etc., have been found. Excavations were commenced in Feb 1859. In 1874, Rev. J. S. BROAD read a *History of Uri*. ANDERSON, *The Roman City of Uric*, illustrative of the *History and Social Life of our Romano-British Forefathers*, 8vo., 1867. W. F. PEACOCK, or *Cole's Tourist's Guide*, 8vo., Manchester, 1860. *Historic Periods of English Architecture, Uriconium*, in BUILDING NEWS *Journal*, 1868, xv, 117. T. WRIGHT, *Guide, etc.*, 8vo., Shrewsbury, 1859. NOTES AND QUERIES *Journal*, s. v. Index.

URILLA. See HELIX, or spiral in the Corinthian capital.

URINAL. It was thought a crime to urinate against the walls of a religious building, and an impious offence so to pollute the tombs in consecrated ground; such a defilement could hardly be expiated; all church spoilers were anathematised, and sacrilege was condemned as the foulest of crimes.

These urinals are of two sorts, *private* and *public*. The private urinal invented by G. Jennings of a basin with flushing apparatus worked by the feet, was first adopted by sir J. Benson, who 1852 fixed 43 in the Great Industrial Exhibition held in Dublin. It is made of iron stoneware enamelled, plain white or marble. Jennings's public urinal was first introduced at the Philological schools, New Road; two at the Peterborough and Retford stations on the Great Northern Railway; and one in the centre of Seven-dials for the S. Giles' district Board of Works, as

stated in 1857. Their present arrangement accommodates six persons in a circle of 4 ft.: offers very little soiling surface, and the grating gives a dry footing; a screen of iron and slate encloses it, and the whole is fixed complete within a circle of 8 or 9 ft. Macfarlane & Co. patented another arrangement of urinal of plates of iron let into an iron frame; single, double, and in ranges. Cleanliness is ensured by the use of non-absorbent materials; a plentiful supply of fresh water for dilution, with sanitary re-agents, will maintain in purity the air about a well-constructed urinal.

The ALLGEMEINE BAUZEITUNG, 1840, pl. 333, gives examples of a *cabinet d'aisance*, a space formed in a wall for a urinal, a pillar urinal, and an octagonal urinal or *chalet*, probably from French examples. Fr. *pissoir*, in DUMONT, *Suite de Projets—Salles de Spectacles*, fol., Paris (1775), pl. 2. A good article on *Urinals* is given in the AMERICAN SANITARY ENGINEER, fol., 1886, p. 348 and continued, with illustrations. The BUILDING NEWS JOURNAL, 1872, xxii, 225, gives a cut showing the manner in which, at Glasgow, it was proposed to collect urine from the public urinals, but it was not carried out. In Jan. 1885, the first "under-ground urinals and closets" or "conveniences", were formed at the west-end of the Royal Exchange; in Oct. 1886 those at the west-end of Eastcheap, 4 closets and 9 urinals cost about £1,300, and in Farringdon street, 5 closets and 9 urinals cost about £1,500, were all designed by W. Haywood, C.E. A good one is to be seen in Covent Garden; and another (1889) at Piccadilly Circus.

Curved masonry 3 ft. high in the angle formed by two walls to protect them from urinal use is called "a shy".

URN. Cinerary urn: a vase of common character. JAR. POT. AMPHORA. VASE. They are frequently found, of various sizes and patterns, in the burial-places of the ancient Britons; also of earthenware, metal, and glass, in Roman sepulchres. The porphyry urn found in the tomb of Hadrian is now in the Lateran. A circular funeral urn or tomb, of Umbria Pollu, is used as a font in Novara cathedral. One in Pistoia cathedral which held the bones of S. Felix. At Palustrine, near Lussowo, near Posen, a vast quantity (10,000) was found from 1 ft. to 3 ft. diameter with decayed bones, or ashes; BUILDING NEWS JOURNAL, 1837, xxiv, 40, KEMBLE, at ARCHAEOLOGICAL INSTITUTE, April 1856, read *A Particular Class of Funeral Urns made in the Form of Duelling*, taken from Aschensleben, Halberstadt, Bornholm, Mecklenburg, Volci, Albano, and representations on the Antonine column at Rome. BROWNE, *Hydriothopia or Urne Buriall*, 1686, 12mo., 1658. BUILDER JOURNAL, 1859, xvii, 159. ARCHAEOLOGIA; see INDEXES. DENNIS, *Etruria*, 8vo., 1848, ii, 390 and 495: 2nd edit., 1878. 25.

Urns, busts, monuments, etc., in flower-gardens are quite misplaced; as any unprejudiced person, capable of attending to his own mind, may feel in the flower-garden at Nuneham, and as reason and judgment may convince anyone who understands the principles of taste; LOUDON, *Country Residences*, 4to., 1806, i, 326.

URNA. The Roman name for a border or fringe; a liquid measure; a reliquary; and a machine of war.

URNELL STONE. "5675 feet of stone called *urnell* bought for the works, at 8s. per 100 ft.", of the clock tower at the palace at Westminster in 1365; BRAYLEY AND BRITTON, *Palaces*, etc., 8vo., 1836, p. 187.

URN STOVE. A large cast-iron stove made in the form of an urn, having a descending flue, was formerly much in use, and about 1775 was in the Rotunda at the Bank of England; it is seen in old views of that apartment.

URRANA (DIEGO MARTINEZ PONCE DE), born at Requena, of much esteem in Valencia, in Spain, designed and constructed 1652-66, the round temple of N. S. de los Desamparados, in that city, near the cathedral. 66.

URREA (MIGUEL DE), a native of Fuentes, in Toledo province. He translated VITRUVIUS, 4to., Alcalá de Henares, 1582; the first edition of that writer in the Spanish language. 66.

URRUTIA (JUAN DE), with Miguel de Santa Celay, designed 1507 the parish church of S. Vicente in S. Sebastian. 66.

URRUTIA (JULIAN DE), of Guipuzcoa, made 1538 the mole of the harbour of Guetaria; added to 1563 by J. Ugarte of Velsua. EL MAESTRO NICOLAS DE URRUTIA, 1564 did various works in the town and port of Gijon. Another JULIAN, a relative of the first-named, 1576 also worked at Gijon. 66.

URSINIGO (SIMONE DE). An error in HAWKINS, *Gothic Arch.*, 8vo., 1813, p. 194, for ORSENIGO (S. DE).

URSULINES. Several congregations of nuns exist differing slightly in habit. The chief order was founded about 1537, confirmed 1544, by B. Angela of Brescia, after the British Saint Ursula (the *Martyrologies*, and note by SELDEN on eighth song of DRAYTON, *Polyolbion*). It was designed mainly for the succour of poverty and sickness, and for the education of young girls. The first house was founded 1604 at Paris; in 1715 there were 350 convents in France; HELYOT, *Ordres Monastiques*. 14.

URTEAGA (DOMINGO), a native of Vizcaya, near Jabea, in Valencia, who, no doubt, designed 1518 the parish church of Sta. Maria de Cocentaina, the agreement for building it by him, is given by LLAGUNA, i, 159; 301: and translated in STREET, *Gothic Architecture in Spain*, 8vo., 1865, p. 461. 66.

URUNDAY and Curupay. Two woods of South America. Timbers cut from these trees and fixed in the ground have been shown to be quite hard and sound when dug up after 200 years; CHAMBERS'S JOURNAL, 30 May 1874, p. 350.

USE. If the effects of use or age have proceeded so far as to destroy the part, or its efficiency in the structure, this argues neglect or misuse, the tenant being supposed to have satisfied himself that every part was sufficiently strong to last to its close; R.I.B.A., *Report on Dilapidations*, 8vo., 1844. 14.

USE AND WASTE. The deterioration on the quality and the diminution in the extent of materials used for temporary purposes, as in shoring up, for which payment has sometimes to be made to a builder. It does not usually include any labour, but it commonly includes, if purposely supplied, the cost of delivery and removal. The allowance is based upon the difference in value between the materials when delivered and when returned to the builder, allowing him profit and interest on the value (if specially supplied) and for any labour expended on the material and not otherwise charged. T. M. R.

USE AND WEAR. According to the usual tenor of a lease, the lessor covenants that the premises shall be delivered, at the end of a term, in as good a condition as the use and wear during the time will permit, and the lessee undertakes to make good any injury which the premises may have suffered. The term "wear and tear" is a popular mistake which the law does not support—use and wear is legitimate—tear is dilapidation. 1.

USTAMBER; an error for VITAMBER. See DIOS (PEDRO DE). He is also said to have built the cathedral of Chartres under bishop Fulbert.

USTIUG VELIKI. See VELIKI USTIUG, in Russian Europe. USTRINA. A malt kiln, 1459-62 (p. 275, 284); SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 452.

USTRINUM. A small square enclosure in which a dead body was burnt if to be buried elsewhere; *ustrum*, if afterwards buried on the same spot. At Pompeii, in the street near the junction of the two roads, near the villa of Diomedes, close to the funeral triclinium, is a sort of long furnace with some iron bars across it, on which was found portions of a sheet of asbestos and some ashes. It appeared to be a permanent place on which bodies were burned, and not like the *ropes* or funeral pyre, which was merely a square pile of wood and could be placed anywhere. It was suggested to professor Minuvini by Arthur Ashpitel, that this was the *ustrinum* or public burning-place; placed conveniently although possibly of some nuisance to the neighbourhood. If this conjecture be correct, it would not only explain the difference between *ustrum* and *ustrinum*, but also the reason why, on so many inscribed public marbles, there is a prohibition to add an *ustrinum* or permanent burning-place, to

a monument. A description of the vessels found in 1821 in a fine Roman *ustrinum*, at Litlington, near Royston, Cambridge-shire and Hertfordshire, is given in *ARCHÆOLOGIA*, 1836, xxvi, 368-76. Another site has been traced outside the walls of Isurium, now Aldborough, and in the vicinity of other Roman towns. 25. 28. 78. 79.

USULLE or UZULD, a Dutchman, is stated to have built 1761-62 the new bridge at Limerick, having three semicircular arches, the centre one 41 ft. span, at a cost of £1,800.

UTENHOVE (MARTIN), of Malines, 1434-54 built the west entrance porch and the square brick tower, 188 ft. 6 ins. high, of the church of S. Martin, formerly the cathedral, at Ypres, on the foundations of the tower burnt 1433; it is unfinished, but is one of the finest towers in Belgium, and is about 189 Engl. ft. high. FLANDRIA ILLUSTRATA. FLEMISH ARCHITECTURE.

UTHINA, Utina; the modern Oudena, about 20 miles south of Tunis, situated on the river Oued Melian, over which is a ruined bridge. Traces of walls of temples, basilicas, and other public buildings can be seen; a ruined theatre, stone seats of an amphitheatre, broken aqueduct, huge cisterns, all show the extent and importance of this Roman city. MORCELLI, *Africa Chr.* GRAHAM AND ASHBEE, *Travels*, 8vo., 1887, p. 43.

UTICA. A town of Zeugitana, in Africa, formerly situated near the mouth of the river Bagradas, but now at Bon-Chater (or Bowshater) some 6 or 7 miles inland. It was one of the oldest Tyrian colonies on the coast of Africa and is one of the oldest known cities of the world. It was the seat of the proconsular government after the Roman conquest of Carthage; and ranked after Carthage in the time of Augustus. The city of Utica, while it enjoyed the rights of *municipia*, solicited the title of a colony, in time of Hadrian; GIBBON, *Decline*, chap. 2. SHAW, *Travels*, 4to., London, 1757. Two cisterns 19 ft. wide and 120 ft. long (which have been turned into farm stables) with other great ones, appear to be all that is distinguishable of this once famed city. GRAHAM AND ASHBEE, *Tunisia*, 8vo., 1887, p. 47-9. GRAHAM, *Tunisia*, at ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1886, p. 156-7. On the discovery 1824 of a temple to Apollo, cedar (THUYA?) was found in perfect preservation, though above 2,000 years old.

UTRECHT (Anc. Trajectus ad Rhenum; later, Ultratrajectum). A town in Holland situated on the rivers the old Rhine and the Vecht; and having two canals through it over which are 28 (or 36) drawbridges. The walls have been levelled and planted; one walk being half a mile long with eight rows of lime trees. The Katherinen gate, before 1638, is by Moreelse.

The dom or protestant cathedral dedicated to S. Martin, was founded beginning of VIII cent. The rebuilding of the choir dates 1254-67, perhaps by maître Jean or magister Johannes (AICARD, *Patria*, 8vo., Paris, 1847, p. 2148, *query* Jean de Chelles); and continued 1322 by Jean de Hainaut, *baumeister*. It is 115 ft. high, the finest in Holland, and is seated like a lecture theatre; the apse has seven chapels; there is a spacious crypt and good cloisters; the nave has been in ruins since the storm of 1674 (not 1676). The west, or central, tower designed and begun 1321 by Johan van dem Doem (or of Hainaut by some writers), or by Jan van Henegouwen; was finished 1382, also stated 1482 by Jan van der Burch; also continued by Jacob van Outshoorn and finished 1382 by Floris van Werlinghoven, (de JONG). This tower is considered the loftiest in the country, being 377 ft. 11 ins. high (also 388 ft. and 321 ft.); and 60 and 62 Rh. ft. on each two sides at the base. The church is 351 Rh. ft. 2 ins. long, by 149 Rh. ft. 2½ ins. wide. It was renovated 1825-30 by T. F. Suys. H. von RIJN, *Descr. of the Bishopric of Ut.*, Leyden, 1719. BELLEGARDE, *Eglise Mét. d'Ut.*, 12mo., Utrecht, 1765. S. de JONG, *Bydrage tot der Goth. Bouwkunst*, fol., Amst., 1847, p. 15-20, plan pl. 9. BOISSERÉE, *Cath. de Cologne*, 4to., Munich, 1843, p. 93. The cloisters were destroyed 1566.

Among the ten other protestant churches are, Pieterskirk,

originally Romanesque with an early crypt; Janskirk, the same with later additions; the porch of S. Nicholas; Nieuwe or Ursula-kirk, choir rebuilt 1515 by Burch; S. Mary's (or English) church, one of its pillars is built on bulls' hides to secure a good foundation, and has an inscription, copied in *NOTES AND QUERIES Journal*, 1862, 3rd Ser., i, p. 28, from Dineley's MS. Tour. Three churches belong to the Jansenists, this city being the headquarters of that body with an archbishop and chapter. Of the five other Roman Catholic churches, that of S. Catherine, XIV cent., was restored by van Brink, it is stone vaulted, has modern stalls and a well-carved bishop's throne: (an "old church" was burnt, 1848). There is also a synagogue.

The public buildings comprise the government house; court house; mint; the *stadthuis*, 1830, the finest modern building in the town, containing a picture gallery, and drawings of the old houses of the town; university founded 1636 having about 500 students, is with its library of 100,000 volumes in a former royal palace; observatory; the museum *Kunstliefde*; and archbishop's museum. A. TOLLUS designed several works near the city. BLONDEEL, *Descr. of the City*, Utr., 1757. SCHOEMAKER, *Descr. of the City*, i, 328. PROUT, *Facsimiles of Sketches in Flanders*, etc., fol. (1837). Van BLESWEYK, *History of Delft*. 14. 15. 28. 50. 92. 96.

UXMAL. An ancient site in Yucatan. The vast extent, variety, and good preservation of the ruins claim for this place the precedence in this province of any other remains of antiquity. The casa de las monjas, is about 300 ft. square with an interior court, each front being of a different design, all were richly decorated and painted; the grand *teocalli*, 100 ft. high with two wide flights of steps to the platform; the casa del Gobernador, standing on three terraces, is 320 ft. front, 40 ft. deep, and 26 ft. high, of hewn stone, having 11 doorways in front and one at each end; there are also others of inferior size and condition. (CHICHEN, CHUNHUHU). GAILHABAUD, *Monumens*, 4to., Paris, 1842-52, iv. STEPHENS, *Central America*, 8vo., 1841; and new edit. by CATHERWOOD, 8vo., 1854. CATHERWOOD, *Views—Yucatan*, fol., 1844, p. 7-8; pl. 11-15. NORMAN, *Rambles in Yucatan*, 8vo., New York, 1843, p. 148-98. CHARNAY, *Cités et Ruines Américaines*, photogs., 8vo. and fol., Paris, 1862-63.

UZES and USEZ (Anc. Uctia). A city in Bas Languedoc, near Nîmes, in France, situated on the river Auzon, near the Seine. It is not found in any authors or acts more ancient than the v century. The old castle, surrounded by high walls flanked with towers, is now razed. It was the see of a bishop, suppressed at the revolution. The ex-cathedral, dedicated to S. Thierry (It. Teodorite), was destroyed in 1611; a good crypt remains; and a font; and the *tour fenestrelle*, a lofty tower of the Romanesque period (XII cent.), a woodcut of which is given *s. v. Campanile, Detached Essays*, p. 2. There is also the church of S. Etienne. The stone cross in the market-place; and a bronze statue 1861 to admiral Brueys, by Duret, deserve attention, as well as the fine ex-episcopal palace with its handsome terrace and park, now occupied as the court-houses and prefecture; (it is supposed to be by the same architect as the château de Castille, near Argilliers); the hôtel de ville; the ducal palace, a great edifice with large and high round towers, and a good small Gothic chapel, restored by the present (1884) duke of Crussol; and several peculiar Druidical works. In the vale of Gisors is the source of the river Ure, which once supplied water by the aqueduct to Nîmes. PIGANTOL, *Descr. de la France*, 12mo., Paris, 1753-54. FROSSARD, *Nîmes et ses Environs*, 8vo., 1834-35, ii, 113: 1846, p. 366. 14. 28. 50. 96.

UZULD; see USULLE, of Limerick.

UZZANO (NICOLAS DA), during the latter part of the xv cent. built the so-called Sapienza, at Florence, which for a time was used as a cage for lions but afterwards as stabling for the grand duke. He also founded and commenced the *liceo* at Florence designed at end of XIV cent. by L. di Bicci. FANTOZZI, *Guida*, 8vo., Florence, 1842, p. 404. 68.

THE DICTIONARY OF ARCHITECTURE.

VACU

V-JOINT. See BEAK-JOINT.

VAAST (JEAN), Vast and Waast. He acted under M. Chambiges of Cambrai at Beauvais cathedral, where they undertook the *croisade* begun 21 May 1500; their signatures are appended to a report dated July 2, 1512, upon the executed works. He died 1524. His son JEAN succeeded him and was associated 11 December 1528 with S. Bernard as assistant to Chambiges, who dying 29 August 1532 was succeeded by M. Lalye and others. As Vaast was buried 8th November 1581, he must have been concerned in the erection of nearly the whole church and with the carpenter Maréchale, of the timber tower and spire, which begun 1560, fell 30 April 1573, and the works were definitively suspended in 1604. His portrait appears at the bottom of the glass in the north transept. WOILLEZ, *Descr. de la Cath. de Beauvais*, fol., Paris, 1838, p. 5; 15. BERTY, *Les Grands Architectes*, 8vo., Paris, 1860, p. 140.

VABRES (Anc. Vabrium; Vabrineum). A town near Rhodéz, in the department of Aveyron, in France. It is the see of a bishop, and is not to be confused with four or five others of the same name in Cantal, Gard, Upper Loire, and Tarn. 96.

VACCARINI (GIOVANNI BATTISTA), 1734 designed a new façade to the duomo at Catania.

VACCARO (LORENZO), also a painter and sculptor, born 10 August 1655, was the best pupil of C. Fansaga. He designed the church of S. Domenico maggiore; and additions to S.S. Nunziata, to Gesù nuovo, to S. Giovanni maggiore, to S. Spirito di palazzo, and to de' padri Predicatori, besides others and many houses, all at Naples. He died in 1706. 36.

VACCARO (DOMENICO ANTONIO), also a painter and sculptor like his father, was born 1680 or 1681 at Naples, where he designed the church of the monastery of S.S. Concezione di Monte Calvario, nearly circular with four arches supporting tribunes or galleries for the monks; and 1724 the teatro nuovo, in a confined locality (or by A. Carasale). He modernised the churches of the Monte Vergine near the Gesù Vecchio; about 1752-53 of Sta. Chiara, carried out by G. del Gaiso; of S. Gaudioso; of S. Giovanni maggiore; and also of Consolazione. In 1731 he designed the church of S. Michele Arcangelo, outside the gate of Santo Spirito; and made additional works to the *molo*. Besides a number of other buildings, he completed 1737 the obelisk and base of the statue of S. Domenico, begun 1657 by C. Fansaga. At *Portici*, the palazzo Tarsia and the little palazzo Caravita; at *Capua*, 1725, the church of S. Giovanni; at *Bari*, modernised the cathedral, which was originally Gothic; at *Teano*, designed the cathedral to S. Giovanni, and works at other places. His pupils were G. Astarita, G. de Gaiso, and A. Donnamaria, and his sons LUDOVICO and ANDREA. The year of death is not given. 3. 36. 68. 95.

ARCHITECTURAL PUBLICATION SOCIETY.

VAIS

VACERRA. The Latin term for a strong paling formed of upright stakes through which ran horizontal poles secured by diagonal planks; it was used to form a *leprolium* or *leporarium*, or enclosure for hares and rabbits. 78.

VACUUM system of ventilation. The vitiated air is drawn out of the room or building, while fresh air finds entrance through channels adapted for the purpose. The "self-acting air-pump ventilator" and other similar inventions, are for the purpose of extracting vitiated air. The "vacuum" pots or windguards are made for the purpose of extracting the smoke by the action of the wind on the upper edge, a principle established by J. W. HORT in his patents of 1825; and the anti-condensative air-conductor of 1852.

VADARINATHA; see BHADRINATH, in northern Hindostan.

VAGARCHABAD, Vagarhabad, Vagharschabad. A village near Erivan, in Georgia. Near it is situated the monastery of Eschmiadzin, Echmiadzin, Etshmiadzin, or Etchmiadzin, founded 524, built 650, which has a wall nearly one-and-a-half miles long and over 30 feet high; it contained three churches built in a triangle; and the tomb of S. Gregory. It is now the see of the catholicos, the proctor-general or patriarch of the Armenian church. The plan of the church of Sta. Ripsime, near the city, is supposed to be copied in that of the church of the monastery at Ateni, in Georgia, by Boghos about 998. DUBOIS DE MONTPERREUX, *Voyage autour de Caucase*, 8vo. and fol., Paris, 1839-43, pt. iii, pl. 6. ROSENGARTEN, *Architek. Stylarten*, 8vo., Brauns., 1857, p. 148-9, three figures; and transl. by COLLETT-SANDARS, 8vo., 1888, p. 191. (Etch maiadzen in) PORTER, *Travels in Georgia, etc.*, 4to., 1821-22, i, 198, 203-6; ii, 619-22. (Ecs miadzin in) CHARDIN, edit. by LANGLES, *Voyages en Perse*, 8vo. and fol., Paris, 1811, pl. 9-10; ii, 171.

VAGHERINO (A...) and CAMILERI (C...), of Florence, 1554 executed the elaborate fountain in the piazza Pretoria at Palermo, which is 138 ft. in diameter and 42 ft. high. HITTORFF, *Arch. Moderne de la Sicile*, fol., Paris, 1835, pl. 52, p. 48.

VAGINA. The Latin term for the lower part of a terminal in which a statue appears inserted. 1.

VAISON (Anc. Æria Vacontrium, and Vasio). A town in the department of Vaucluse, in France, situated near the torrent Ouvèze. There are several Roman remains; a tomb, a one-arched bridge and two arches of an amphitheatre, all given in LABORDE, *Monumens de France*, fol., Paris, 1816, i, pl. 88-90; many fragments have been removed to the museum at Avignon. The ex-cathedral, dedicated to the Virgin, is of XI cent.; LABORDE, i, pl. 115, who dates it IV cent. in error: a diagram of the Provençal vaulting is given in FERGUSON, *History of Architecture*, i, 448-9. The chapel of S. Quinde or Quenin, *cir.* IX or X cent., has a singular apse; FERGUSON, i,

456; LABORDE, pl. 116. There is also a small church late renaissance in character. BOYER DE SAINT-MARTHE, *Histoire de Cathédral de V.*, 4to., Avignon, 1731. RAMÉE, *Hist. Gén. de l'Architecture*, 8vo., Paris, 1843, ii, 173. MERIMÉE, *Notes d'un Voyage dans le Midi*, etc., 8vo., Paris, 1835, p. 173-4. ROYAL INST. OF BRIT. ARCHITECTS, *Tour in Provence*, etc., *Notes*, etc., 1888, iv, 138-9, gives the cathedral belfry. 14. 28. 50. 96.

VAL (SIEUR DU); see BROUET (A.); and DUVAL (A.).
VALADIER (GIUSEPPE), cavaliere, born 14 April 1762 at Rome, gained 1773 the grand prix of the academy of S. Luke. In 1811 he was appointed architect to the prefettura at Rome; 1813 to the municipality; and carried out the alterations and other works for Napoleon I. Before 1823 he designed the villa of prince Poniatowski. In 1824 he was appointed to rebuild the basilica of S. Paolo. 1825 altered the chapel of the Assumption in the basilica of Sta. Maria maggiore into a baptistery, for pope Leo XII (LETAROUILLY, *Rome Moderne*, 4to., Paris, 1840-50, p. 614, 616; pl. 304). 1825-6 designed the façade of the church (about 1612 by G. Guerra) of S. Andrea delle Fratte (LET., p. 325). About 1830 completed the upper order of the façade of the church (1585 by M. Lunghi) of Sta. Maria della Consolazione (LET., p. 135, 339, plan pl. 150). 1840 replaced on another site the monastery (by B. Pontelli) of Sta. Maria del Popolo (LET., p. 518-9, pl. 233), with other improvements there. 1831 restored the garden fronts of the palazzo di S. Giorgio, called della Cancelleria, by the (Giamberti) Sangallo and Bramante (LET., p. 230). At Gubbio he designed the *orfanotrofo*. He published *Progetti Archit.—inventati dall' arch. camerale G. V.*, etc., fol., Rome, 1807; *Sulla scoperta fatte nello Scavo al lato, e facciata del Pantheon nel 1804*, by CUCCORNOS, 4to., 1807; with VISCONTI, *Insigni fabbriche di Roma antica e sue adiacenze*, fol., Rome, 1810-26. *Nar. Artist. dell' operato—nel restauro nell' Arco di Tito*, 4to., Rome, 1822. *L'Architettura Pratica dettata nella scuola e cattedra nell' accademia di S. Luca*, text 5 vols., and pl. 2 vols., fol., Rome, 1829-39. *Opere d'Architettura e di Ornamento*, etc., fol., Rome, 1833. *Aggiunta e corr. all' opera sugli edifizii Antichi di Roma dell'—Desgodets*, 2 pts., fol., Rome, 1843. He died 1 Feb. 1839, aged 77. His son LUIGI followed the profession and settled at Naples where he designed the church of S. Francisco de Paula. SERVIZI, *Notizie*, Bologna, 1840; VISCONTI, *Biografia*, in ALBUM DISTRIB., 12 an VI, 1839. TIPALDO, *Biografie degl' Italiani*, Venice, 1841. CIAMPI, *Vita*, 8vo., Rome, 1870, from GIORNALE ARCADICO, lxiv, new series. 68.

VALANCE (It. *valenzana*). The fall or edging of hanging drapery along the edges of the frame of furniture (as to a tester, or sperver, or canopy) at the side of a bed between the frame and the floor. 16. 17.

VALANDY (WILLIAM), 1434 was magister fabricae at the bridge over the river Tay at Perth. It was rebuilt 1599-1616; and again 1768-70. BANNATYNE CLUB, *Account of Great Chamberlain*, 4to., Edinb., 1817, iii, 264: referred to by ROBERTSON, in ARCH. INSTITUTE OF SCOTLAND, *Transactions*, 1851, i, 59; and BULDER *Journal*, 1851, ix, 53.

VALANTINY (GRÉGOIRE), devised *Nouveau livre de Porte du Chambre*, etc., 6 pl. engraved by Gerard Jollain, fol., Paris, 1687: he is entitled "Architecte ord^e de S.A.S. le grand duc de Toscane".

VALCATORIUM. Late Latin term for a milkdam.

VAL DE TRAVERS. A village in the canton of Neuchâtel, in Switzerland, situated on the river Reuse. It affords a bituminous limestone, which gives compressed and mastic asphalt for paving of all sorts. It was first introduced into England in 1853, and by 1872 the Poultry, Cheapside, and Holborn had been paved with it. For roadways the rock is ground to powder, and whilst in a heated state is brought to and strongly compressed into its place with heavy hot irons to fuse the materials so that it becomes quite hard. For roadways it is laid from 1½ to 2½ ins. thick. For the liquid or mastic asphalt, the rock in the first place is ground to powder,

then brought to the place and placed in cauldrons together with a small percentage of bitumen as a flux. When heated, the mixture becomes semi-liquid, when from 40 to 60 per cent. of sandy grit is added. When well mixed it is spread over the concrete in one layer varying from 1 in. to 1½ in. in thickness. BULDER *Journal*, 1871, xxix, 890; and xxx, 109. BITUMEN.

VALDELVIRA (PEDRO DE) and Vandaelvira, was born 1485 at Jaen, in Spain; studied in Italy and built or designed 1540 the castle at Sabiote, belonging to the marquis of Camarassa; between 1540-56 designed the celebrated capilla mayor del Salvador, at Ubeda, for don Francesca de los Cabos, for whom he in 1550 also designed a palace; they are both profusely ornamented, also the portal of the Dominican church adjoining it: in 1525-34 the new cathedral at Jaen, which was only begun 1540: about 1540 the *capilla mayor* to the cathedral at Baeza; and in that town 1562 the hospital with its chapel of S. Giacomo, considered one of the best buildings in Andalusia: also its gates called Cordova, Baeza, and Ubeda: in 1561-5 the *casa de ayuntamiento* at Seville, the richest renaissance work in Spain, wrongfully ascribed to Berruguete (died 1561); and also 1565 designed that at Jaen for the bishop.

His sons FRANCISCO and CRISTOBAL 1546 built from the design by PEDRO the capilla mayor at Baeza. Another son ANDRES, born 1509 at Alcaez, continued until 1579 the works at Jaen cathedral, being the south front, chapter-house, *pantheon*, sacristies, and chapels on the epistle side, in the plateresque style: 1557 visited Seville to examine the capilla real of the cathedral: 1562 designed additions (or the design by his father) to the hospital and chapel of Santiago at Ubeda, the statues to the altar-piece and the choir-stalls; and the parish church at Villacarrillo, near Ubeda. A Barba was a pupil, and in accordance with Andres's wishes in his will succeeded him at Jaen, "as he had instructed him in all the secrets of the art". Andres died in 1579. 3. 66. 68.

VALDOMAR (mestre ...). A native of Valencia in Spain, 1459 designed the enlargement of the cathedral from the coro to the west entrance and up to the tower, all since altered. He was succeeded by P. COMPTE or Conde, who continued this work up to 1482. In 1439-76 Valdomar designed the capilla de los reyes in the monastery of S. Domingo, now desecrated; and was maestro mayor to the municipality. 66.

VALDRE (signor ...) and Valgre; a native of Italy, was employed by George, duke of Buckingham, at Stowe, where he altered and extended the gateway on the hill, from the Oxford road (designed by W. Kent); designed two gateways into the courts on the north side; altered for the support of four lions the pedestal of lord Cobham's pillar; designed and executed the over three hundred figures to the attic of the saloon; with the design, decoration, and execution of the music-room; as described in STOWE, *Descr. of the House*, etc., 8vo., Buck., 1797; and 1817. (KENT. PITT. BORRA.) When the duke was 1787 again appointed viceroy of Ireland, Valdre attended him, and there he designed various edifices and remained in that country PASQUIN (i.e., Williams), *Artists of Ireland*, 8vo. (1790?), 52.

VALENCE. (The capital of the Segalauni or Segovellauni; the Roman Valentia; It. Valenza.) The capital of the department Drôme, in France, situated on the river Rhône, crossed by a good suspension bridge. It has a citadel erected for François I (now a caserne du génie); and battlemented walls flanked by towers. A house in the main street, the *maison des têtes*, is a very rich specimen of the XVI cent. florid Gothic (LABORDE, *Monuments de France*, fol., Paris, 1816, pl. 203); another with renaissance details (pl. 223); and another has a good renaissance staircase. Valence is the see of a bishop. The small cathedral, formerly dedicated to S. Stephen and now to S. Apollinaire, is of a cross form with long transepts and a pier in the centre, in the Auvergnese variety of Romanesque, lighter in style than the English Norman, consecrated 1095; injured in the wars; and restored 1604; porch rebuilt 1861. The old tower, 187 ft. high (FERGUSON, *History*, i, 461), was rebuilt 1862 "in refined

romanesque" by Pallu. On the north side is a renaissance work 1548 called *le Pendentif*, a tomb for the Mistral family; with peculiar vaulting, first practised here (Q. de QUINCY, *Dict. d'Arch.*). There are also the church of S. Jean Baptiste (romanesque), rebuilt 1847 except an early Pointed porch and tower; and two other churches; a jewry; the former residence of the bishop; the prefecture in a former abbey; university founded 1452 or 1454 and rebuilt at a much later date; a "little seminary" in which is the picture-gallery, museum, antiquities, and library; and other public buildings. VAYSSÉ DE VILLIERS, *Itinéraire descr. de la France*, 8vo., Paris, 1813-39. J. OLLIVIER, *Essais hist. sur la Ville de Valence*, 8vo., Paris, 1821. TAYLOR ET NODIER, *Voyages Pittoresques* (Dauphiné), fol., Paris, 1843-45, p. 183. BUILDING NEWS *Journal*, 1859, v. 986. 14. 15. 28. 50. 96.

VALENCE (PIERRE DE). Master-mason at Tours, where 1506 he directed the supply to the fountains; 1508 he received 90 livres a year. Between 1503-9 he visited occasionally the château de Gaillon to inspect the works; and to erect the fountain sent 1511 by the Venetians to the cardinal George d'Amboise. In 1504 he was one in a conference at Rouen cathedral. 1516 declined the work of the tomb to the cardinal for Rouen cathedral (the work 1518-20 of R. le Roux). 1518 was engaged on portions of the monument to Louis XII for S. Denis; and died in or about the same year. DEVILLE, *Comptes des Dépenses du Château de Gaillon*, 4to., Paris, 1850, p. cviii, and index p. 463, for numerous references to this artistic workman. LANCE, *Dict. Biog.*

GERMAIN his son assisted him at Tours; MICHEL, probably a brother of Germain whom he succeeded, was also engaged 1525 at the château de Plessis lez Tours; 1528 executed works at Fontainebleau; and died 1529. CARDIN DE CHANTELOU dit Valence, a nephew, succeeded his uncle at Tours from about 1539-69; made a fountain at Loches; and 1553 one for Diana de Poitiers at Chenonceaux. GRANDMAISON, *Arts en Touraine*, 8vo., Paris, 1860. LANCE, *Dict. Biog.*

VALENCIA and Valentia. A small town in the island of Valencia, on the coast of Kerry, in Ireland. The island has an important trade in green slate-slabs of larger sizes than are produced in any other quarry: slabs are raised about a foot thick, but having no true cleavage, they require to be sawn. The slate is non-absorbent and more brittle than Bangor metal; it takes a permanent polish, and is valuable for enamelling, being unaffected by furnace heat. An inch cube crushes under six tons (average 5.14 tons; and a three-inch cube under 5.29 tons; MAHON). WILKINSON, *Geology, etc., of Ireland*, 8vo., 1845, p. 31, 168, and No. 105 of App. BUILDING NEWS *Journal*, Ads. July 10, 1858; Oct. 2, 1858; 1859, xvii, 19; Aug. 22, 1863, p. xvi.

VALENCIA and Valencia del Cid (Anc. Valentia Edetanum and Edetanorum; Fr. Valence; It. Valenza). The capital of the ancient kingdom and modern province of the same name, situated on the stream Turia or Guadalaviar, much subject to inundations; along which are good quays, and is crossed by five wide and massive bridges of from ten to thirteen arches each; that of Seo is given in TAYLOR; of Serranos built 1541 (in LABORDE); La Trinidad 1356, and the Real, restored for Charles I or V (1519-58). The sewers are said to be Roman work, and very solid. The port of el Grao is three miles distant. Valencia was founded by Junius Brutus, destroyed by Pompey, and rebuilt: the Moors held it from 712 to 1094 and again 1100 to 1238. The citadel was built for Charles V against Barbarossa, the sea rover; the *tapia* or battlemented walls built 1356 for Pedro IV were pulled down 1871: of the former twelve gates, that of Serranos, begun 1349, and of el Cuarte 1444, both fine examples, are now prisons; the puerta del Cid is remarkable; some have towers and machicolations. The houses are very Moorish, solid-looking, with colonnaded patios, some elliptical; flat roofs, and good staircases. The casa Pinohermoso, now the British consulate, is a good specimen; the palace of the marques de dos Aguas is "a supreme effort of the

lunatic vagaries of the rococo" (LEIGHTON, *Lecture*, Dec. 1889). The only great fountain, by J. B. Perez, is in the plaza mayor or S. Juan; the *glorieta* with its fountains and statues is a favourite promenade. The baths of the Moors is given in LABORDE. Valencia is the see of an archbishop.

The cathedral, called *La Seo*, built on the site of a temple to Diana, was dedicated to the Saviour, became a mosque, is now dedicated to the Virgin; and 9 July 1492 was raised to metropolitan rank. It was begun 22 June or 23 August 1262; the façade of north transept having a round window is possibly of the latter half of XIV cent.; the *cimborio* or lantern at the crossing about 1404; from 1459 it was lengthened four bays from the *coro* to the west end by Valdomar, and the upper part continued up to 1482 by P. Compte or Conde; the *trascoro* dates 1466; 1486 the marble pavement was by him and P. Vinya; 1682 the church decorated and marble pavement to the presbytery by J. B. Perez; *cir.* 1760 the whole "Corinthianised" by A. Gilabert; the façade *cir.* 1780 with three orders was added by C. Rodulfo. The *illeria* is of walnut; the retable burnt 21 May 1469; the rich altar mayor restored 1498 was despoiled 1809; the high altar dates 1862. The sala capitular antigua 1358 by another P. Compte, is 60 feet square and groined in stone, and good. The curious and detached north-west tower called "el Miguelete" and "Micalete" (from S. Michael), is 162 ft. high with a modern finish; it was intended to have been 350 ft.; begun 1381 by Juan Franch; in 1414 P. Balaguer, the *arquitecto perito*, visited and examined the towers and belfries at Lerida, Narbonne, and other cities to complete it; and 1424 M. Llobet contracted to finish it.

There are fourteen parish churches. S. Martin has four columns of the rare broccatello di Spagna from Tortosa, the sacristy 1725-39 by J. de Cardona y Pertusa; Santos Juanes, a marble pulpit from Genoa; S. Nicolas was a mosque; S. Esteban; S. Salvador; the Templars, its tower destroyed 1865 for a new street; S. Bartolomé restored *cir.* 1685 by J. B. Perez; S. Cristo del Grao (the steps), the *camarin* *cir.* 1780 by B. Ribelles; S. Juan del Mercado rebuilt 1628 by J. M. Oriens; S. Cruz 1705 by J. B. Vinyes; S. Felipe Neri 1723 by T. V. Tosca; and De los Minimos, campanile by J. de Cardona y Pertusa.

The monasteries are now mostly suppressed.

The once magnificent S. Domingo; now barracks of the citadel; 1459-76 by Valdomar; the chapel and cloisters are good late Gothic; the capilla de capitulo has four light pillars; the capilla de los reyes founded by Alonso V of Aragon (1416-58) by Valdomar 1459-76, is now the panteon provincial; the new entrance, cloister, and infirmary *cir.* 1780 by B. Ribelles; the celebrated chapel of S. Vicente Ferrer and the cell of S. Luis Beltran *cir.* 1785 by A. Gilabert.

S. Francisco el grande; its cloisters 1421 by M. Navarro, who was paid 100 florins for each arcade.

N. S. del Carmen Calzado; 1644 by A. fr. G. de Sant Marti; the highly praised chapel *cir.* 1775 by V. Gasco; also the decorated Pasco al Grao (or steps).

The Augustines; the chapter-house and tower *cir.* 1685 by J. B. Perez. Church of the Monks de la Zaedia by A. Gilabert.

"El Temple" of the order of Montesa, the monastery and three-ailed church 1761 by Mig. Fernandez for Charles III (1756-88), and by F. Rubio, is now the custom-house.

Six colleges—the college and church of Corpus Christi, or del patriarcho, 1586-1605 are by A. del Rey, after a plan by Herrera it is said; handsome *sacristia*, a sala capitular, and a fine staircase to upper cloisters, and library. The destroyed temple of N. S. de los Desamperados 1652-66 by D. Martinez Ponce de Urrana. The church and college of S. Pio V (1566-72) by J. B. Perez, J. Perez, and J. Miguez.

Near the city is the celebrated Hieronymite church and monastery of S. Geronimo, at S. Miguel de los reyes; designed 1544-46 by A. de Cavarrubias with Vidania; 1590 the *coro* by J. de Ambuesa; the new church 1623-32 by P. de Ambuesa, and completed 1644 by M. de Orinda; its fine Ionic cloisters 1580-1605 by J. Barresa and J. Cambra; and 1763 the new cloister by F. de Sta. Barbara. At Burgasot, are caves used by

the Moors as granaries; thirty-nine crypts are still partly so occupied.

Among the town buildings are: The residence of the captain-general, formerly viceroy. Episcopal residence, with a library 1762 of 10,000 volumes in the former corn-exchange. *Audiencia* or court of justice (good Doric), now several public offices, the saloons having richly-carved ceilings in the *mudejar* style of Moorish architecture, *temp.* Ferdinand the Catholic and Philip I (1476-1516); the *salon de cortes* on the first floor is one of the finest and most remarkable rooms in Europe; its ceiling finished 1561 is well carved in native pine, and all round at the top is a narrow gallery. University founded 1411 or 1500, burnt 1812, has now a library of 42,000 volumes formed from the suppressed monasteries. Museum of natural history, etc. *Museo* formed 1836 in part of the monastery of Sta. Cruz; its chapel now holds the antiquities. Academy of fine arts. The former *aduana*, *cir.* 1758 by F. Rubio and A. Gilabert, is now a cigar factory; the present custom-house is in the former "el Temple". *Longa de seda* 1482-98, perhaps by Valdomar and Compte, Gothic and Moorish (CHAPUY, *Moyen Age Monumentale*, fol., Paris, 1840-44, pl. 96 or 200); it is like that at Palma and has a curious spiral staircase. The *longa* or exchange with spiral pillars, is 120 ft. by 80 ft. by 60 ft. Cast. high (in LABORDE; and MONUMENTOS ARQUIT. DE ESPAÑA, fol., Madrid, 1859-86, two plates), or 130 ft. by 75 ft. (in STREET), begun 7 Nov. 1482-98 by Pedro Compte. General hospital, its baths designed *cir.* 1780 by J. Garcia; the elliptical chapel of that of *los Esculapios* by F. Rubio and A. Gilabert. Principal, Princesa, and Apolo, theatres. *Escuela pia* 1738 a vast seminary with a church, a fine rotunda. Orphanage with a pretty chapel. The *plaza des toros* for bull-fights was designed 1849 by Seb. Monleon, and built 1857-60; it is 462 ft. external diameter; the arena 250 ft. diam. and 86 ft. high; having 15,851 seats, and said to be the finest in Spain. A hippodrome; good new theatre; and model prison in the former college of S. Agustins, are to be noticed. The manufactory of *azulejos* or enamelled tiles was formerly esteemed.

ESCOLANO, *Historia de la Insigne Ciudad y Reyno de Valencia*, fol., Val., 1610-11. SWINBURNE, *Travels through Spain*, 4to., 1779-87, p. 94; and *Pictorial Tour*, fol., 1806. LABORDE, *L'Espagne*, fol., Paris, 1806-11, i, pt. 2. FISCHER, transl. by SCHOBBERL, *Picture of Valencia*, 8vo., 1808; reviewed in CRITICAL REVIEW for 1809, Ser. 3, xvi, 50-61. TAYLOR, *Voyage en Espagne*, 3 vols., 4to., Paris, 1826 and 1832. CHAPUY, *L'Espagne, Vues*, etc., fol., 1842. STREET, *Gothic Architecture in Spain*, 8vo., 1865, p. 260-72. DEVERELL, *All round Spain*, 8vo., 1884, p. 23-44, who also describes the Moorish irrigation, and tile factory. CAVANILLES, *Hist. Nat. de Val.*, fol., Madrid, 1795-7. 14. 28. 50. 96.

VALENCIA (JUAN DE), presbitero, a pupil of L. de Vega, and of J. B. de Toledo, from 1563 worked at various places at Madrid and elsewhere under his direction and of J. de Herrera; the latter 1584 recommended him in his will to the king. He designed the body of the church of the monastery of Santissima Trinidad, at Madrid (now suppressed), including the east and south sides of the cloister, and the great dormitory running north and south; all chiefly erected 1590-1611 by G. Ordoñez. He died 7 June 1591 at Valencia. 66.

VALENTIN (...). A pupil of M. A. Buonarrotti, assisted in modernising the cathedral at Oporto, in Portugal. PATRIARCHE, *Liste des Arch.*; REBELLO DA COSTA, *Descr. do Porto*, 1789, p. 58. 68.

VALERIUS of Ostium, B.C. 27, was one of the chief architects and engineers of his time; he put a roof of timber over the great theatre at Rome (? the Coliseum), when Scribonius Libo the edile (*temp.* Cicero) exhibited games; PLINY, *N. H.*, xxxvi, 15, 24. The Pantheon at Rome is attributed to him B.C. 27 for Marcus Agrippa (DION CASSIUS, lib. i); it is also ascribed to Hadrian 117-138; also to a date between 79 and 117. This building has also been attributed to L. COCCERIUS Auctus.

VALERIUS ARTEMA (MARCUS), a freedman of Menandrus, known by an inscription "M. Valeric. M. F. Pol. Artemae architecto, etc.", in GUDIUS, *Inscriptiones*, fol., Leov., 1771, p. 224, nr. 9; and "M. Valerius M. L. Artemas", in REINSESIUS, *Synagoga*, fol., Leipsic, 1682, p. 616. The Fani Fortuna in the temple of S. Martini at Rome, is attributed to him. 3.

VALETTA, Valletta, and La Valetta. A seaport and the chief town since 1570 in the island of Malta, situated on a long neck of land having the great, and the quarantine (with its good lazaretto), harbour on each side. The place was obtained 4 March 1530 by the knights of the hospital of S. John of Jerusalem (founded by Paschall II, 1099-1118) from Charles V of Spain, and strongly fortified by them: it was taken 4 or 5 September 1800 from the French by the English, to whom it was confirmed 1814. Fort S. Elmo with its chapel was taken 1565 from the knights after a siege. It was laid out by Girolamo Cassar or Jerome Cassan (a knight celebrated for his fortifications) for La Valetta, who laid the first stone 26 or 28 March 1566, and completed 15 May 1571 by P. de Monte, his successor. Access to the different streets is obtained by flights of steps, forming a peculiar feature of the place; the streets are wide and paved with lava. The *strada reale* is about a mile long; seven inner streets run parallel with it, and eleven cut it at right angles. The squares are spacious and handsome; and in the lower part, or *marina*, the splendid quays have elegant edifices. The houses have flat roofs, but those of the knights are known by their pitched roofs (JONES, *Mode of Building Houses in Malta*, in CORPS OF ROYAL ENGINEERS, *Papers*, 4to., 1842, v, 196-206. Some of the *auberges* or knights' residences are magnificent; that of Castile, the largest and finest, is occupied by the royal artillery and engineers; A. de Bavière, 1786; A. d'Italie, headquarters of the royal engineers; A. de France and A. d'Auvergne, now the courts of justice; the roof of A. de Provence is given in CORPS OF R.E., etc. Palace Parisi, occupied by Napoleon I, now lively stables. Upper Barracca or Knights' promenade 1661. New sanitary and waterworks, and dwellings for the poor have been erected. The aqueduct, cost £13,000, 8 or 9½ miles long, 1610-14 by Victor Bontadino of Bologna, or padre Natale Masuccio of Messina; and *cir.* 1700 with underground channels to the houses. The Coradino tank in Malta 1841-42 is perhaps the largest covered tank in Europe, being 700,000 cubic ft. capacity.

The co-cathedral with Città Vecchia, formerly the church of S. John of Jerusalem, begun 1573 by G. Cassar and consecrated 1578, includes nine chapels forming the aisles, being richly inlaid with marbles, an attached oratory, sacristies, and campo santo; the crypt contains the remains of twelve grand masters; the fifty-six seats with misereres and the pulpit date 1598. The high altar by Bernini at Rome cost £4,500. The pavement exhibits about 400 sepulchral slabs of marbles of various hues, memorials of the knights in costume and with emblems; also other grand tombs in marble and bronze in the chapels. The stone ceiling or roof was decorated with paintings 1661-99 by M. Preti (DOMINICI, *Vite dei Pittori Nap.*, 8vo., Naples, 1840-46, iv, 3-106). *La Chiesa dei S. Giov. Batt.*, 8vo., Malta, 1848. *Collezione di monumenti e lapidi Sepolcrali, dei Meliti Girosolimitani nelle Chiese di S. G. in Malta*, 3 vols., fol., Malta, 1838-40. Interior, in ROY. INST. OF BRITISH ARCHITECTS, *Transactions*, 1889, p. 45-6. It is 187 ft. long, 50 ft. wide and 118 ft. including the chapels, and 63 ft. high. There are about twenty churches: S. Vittoria was the first built; S. Ursula; the Jesuits' church; Sta. Maria di Gesù; Augustinian monastery, painted by M. Preti 1663-98, or Favray 1680-1708; the English church of S. Paul (Ionic) was built 1839-49 for queen Adelaide, the interior is 110 ft. by 67 ft. by 45 ft. high, and holds 1,500 persons; ILLUST. LONDON NEWS, 1850, xvi, 36. Opposite to it is the palace of the bishop of Gibraltar.

Palace of the grand master, now the governor's residence, consists of two courts; the staircase was 1866 reconstructed in marble, as the former one which enabled the grand master to be carried

up it in his state chair; the fine corridors and rooms contain a rich collection of armour and in the armoury; the hall of S. Michael and S. George, which is a throne and hall-room; a tower built for an observatory and now a signal station; a library 1760 or 1784 now public, and a museum of Roman and other antiquities from Gozo and various places in the island. University founded 1768; the lyceum with former Jesuits' church; courts of justice in the former *auberge* d'Auvergne; military hospital 1628 for 382 beds, one room being 502 ft. long by 34 ft. 6 ins. wide without a central support; the bagnios under, formerly occupied by the slaves of the knights, are now naval stores, (plan by R. R. Rowe, given in BEDFORD, *Regulations, etc.*); naval hospital 1830 is the finest in Europe; two civil hospitals, for 250 males is in the former Maddalena monastery; the female (now 250 of both sexes) was founded 1646 by Caterina Scappi of Siena; hospital for incurables, 1862 by T. H. Wyatt of London (plan in *Illustrations, s. v. Hospital, 1863-65*, pt. 1); orphan asylum for 150; market 1861; theatre or opera-house, 1863-66 by E. M. Barry of London, cost about £80,000, for 1,200 seats; it was damaged by fire 1873; (plan in *BUILDER Journal*, xxi, 314; xxiv, 813, 832 is section of roof, the flat covered by the native "dyphoon" (*diffone*) six inches thick to keep out heat); extensive barracks; new gymnasium, racquet-court and baths; dockyard capable of admitting the largest man-of-war; in one cove are three immense arches under which the galleys of the Order were built and protected from the weather; military prison, etc.; and immense subterranean stores for grain; a section of a "cone" for preserving wheat is given in CORPS OF R.E.; as is also a section of the three-story granary attached to the grand bakery. JOHN OF JERUSALEM (S.).

Floriana.—Its fortifications 1635 designed by an Italian engineer, but not carried out until 1720; immense granaries in pits; parade grounds, barracks, botanic garden 1805, *ospizio* 1734 for 700 aged men and women, also for foundlings, penitentiary and female prisoners; civil hospital of S. Calcedario 1751, also called casa della Madonna di Manresa; barracks; and Capuchin convent 1584, showing dried bones in the crypt.

Vittoriosa.—Fort S. Angelo is the oldest, having a Roman guard-house; its chapel dates from 1090; the English church the work and tomb of L'Isle Adam 1534; its red granite pillar is part of a temple to Juno; near it are the prisons of the galley slaves down to 1778; church of S. Lorenzo, founded *temp.* of count Roger, enlarged by the knights before Valetta was built, and rebuilt 1697; the palace of the inquisitor 1634, abolished 1793, now the head-quarters of a regiment; convent of Sta. Scolastica, formerly the hospital of the knights; and a Dominican monastery. There are two other suburbs of Cospiccia and Senglea with the country villa places of S. Julian's and Sliema.

A plan of Hagiar Khem, supposed Phœnician, has been partially restored; and Mnajdra, having elliptical chambers; are given in FERGUSON, *Rude Stone Monuments*, 8vo., 1872: and DALY, *Revue Générale*, 1841, ii, pl. 21; VASSALLO, *Dei monumenti Antichi nel Gruppo di Malta, cenni storici*, Val., 1851; *Journal of ARCHEOLOGICAL ASSOCIATION*, v, 78, gives the catacombs at Città Vecchia. GOZO. CITTÀ VECCHIA or città Notabile. Musta church 1833-64, erected over the old parish church, cost £21,000; Grognet, of Malta, engineer; Angelo Gatt, clerk of the works; built on the model of the Pantheon, dome 118 ft. diameter; no scaffolding used. 14. 28. 50. 96.

ABELLA, *Della descriz.*, fol., Malta, 1647; *Malta illustrata*, by G. A. CIANTAR, fol., Malta, 1772-80: *Descriptio Melitæ*, fol., 1725, GREVIUS, xv. Plan in S. NON, *Voyage Pitt. de Naples, etc.*, fol., Paris, 1781-6, iv, 264 end. *A Description of Malta, etc.*, 4to., Malta, 1801. SONNINI DE MANONCOURT, *Voyage en Grèce, etc.*, 8vo. and 4to., Paris, 1801. BRÈS, *Malta Antica illustrata*, 4to., Rome, 1816. FRANKLAND, *Travels to and from Constantinople*, 8vo., 1829, ii, 199. WRIGHT, *Mediterranean Scenery*, 4to., 1840. W. PORTER, *Knights of Malta*, 8vo., 1858; 1883. TALLACK, *Malta*, 8vo., 1861. CASOLANI, *General Administration and Internal Affairs of Malta*, 8vo., 1867. BEDFORD, *Regulations of the*

old Hospital of the Knights at Valetta, 8vo., 1882. ZAMNIETT, *Malta and its Industries*, 1886. GODWIN, *Guide to Maltese Islands*, 8vo., Malta, 1880.

The stones of Malta and Gozo are of two qualities, hard and soft. The hard (limestone) is of three qualities, first, second, and third. The first is used according to its colour; white for the first three or four courses in housebuilding; yellowish or reddish for pillars, columns, paving, ornamental strings, and takes a polish like marble. The second quality is used for lime, of first and second quality according to the stone. The third quality supplies the spalls for the repair of the streets. The soft stone (sandstone) is of different qualities according to colour and strength; and is used for building purposes, flags, and steps of any dimensions; *Local information. Malta Times and United Service Gazette*, 13 Dec. 1889. "Thirty-nine trials of resistance of Malta and Gozo stone to Thrusting-stress," by messrs. Kirkaldy for "The Crown Agents for the Colonies", Downing street, price 3d.

The island is formed of a calcareous rock more or less indurated, varying much in quality; it is quarried in large blocks, hardening by exposure to the air, easily worked; the arms of the grand master in the south front of his residence in fort S. Angelo are about three hundred years old, and perfect. A cubic foot of hard stone weighs 146 lbs. dry; the soft stone 122 to 144 lbs.; a flooring stone 18 ins. square, 65 lbs. JONES, in *Papers, etc.*, named in first paragraph. BURNHAM, *Limestones and Marbles*, 8vo., Boston, U.S.A., 1883, p. 199. GODWIN, *Geology, etc., of Maltese Islands*, 8vo., Malta. SPRATT, *Geology, etc., of Malta*. The "Pecten beds" afford the best building stone; it is much used along the Mediterranean coast. It must not get touched by sea water, for a single stone affected, incrustations, etc., follow, which spread rapidly and cause the walls to crumble; BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 26.

VALETUDINARIUM. Late Latin term for an infirmary in a monastery.

VALFAUT (...). The architect of the hôpital S. Louis, at Paris, built 1604-17; SAUVAL, *Histoire*, fol., Paris, 1724, i, 561.

VALFENIÈRE (FRANÇOIS DE ROYERS DE LA). A native of Piedmont, settled at Avignon; 1536-37 he practised at Lyon for the marquis de Saluces; and perhaps at the arsenal. His son MICHEL ANTOINE RAIMOND, 1584 employed at Avignon, died Sept. 1594; and was succeeded by Balthazar de Montagut.

VALFENIÈRE (FRANÇOIS II DE ROYERS DE LA), his son, born August 1575, designed about 1612 the staircase to the chapel of S. Pierre de Luxembourg, at Avignon; where 16 December 1622 he was employed on the decorations for the entry of Louis XIII.; 1624 presided at the alignment of the river Durance; at the entry of cardinal Barberini 1626; the decoration of the church Oratoire de Bourg S. Andréol (plan dated 17 March); 1642 several repairs to the gallery and "l'arceau" of the college of Aoure, now the hôtel de la préfecture de Vaucluse; 1636 architect to the chartreuse de Villeneuve les Avignons, designed most of the buildings, and was employed up to 1543; 1640-57 began the construction of the episcopal palace at Carpentras, now the palais de Justice; 1645 designs for the restoration of the church at Caromb; and 18 March 1659 first stone was laid of his design for the abbaye royale des Dames Benedictines de S. Pierre at Lyon, when 84 years of age. He died 22 March 1667 at Avignon, aged 92, and was buried near the staircase of the church of S. Pierre.

PAUL DE ROYERS DE LA V., the son or nephew of François II, conducted from 1659 the works of the abbey church; and 1660 was witness in the markets to agreements with carpenters, and 1661 with A. Danguin, *tailleur de pierre*; and he is lost sight of after 1664.

FRANÇOIS III, son of François II, in Sept. 1666 stayed fifteen days at Arles to design the hôtel de Ville; stayed twenty-six days to examine the model of the grand staircase and gave orders for the continuation of the building. In 1675 he was succeeded by Jacques Peytret; and 9 June 1683 designed the maison com-

mun. These accounts are derived from CHARVET, *Les Roysers de la Valfenière*, Lyon, 1870; in LANCE, *Dict. Biog.*

VALFENIÈRE (N... DE LA), at Lyon, about 1667 designed or built the imposing façade next the place des Terreaux, of the former monastery of S. Pierre, restored by ... Dardel for the palais des Arts; to which a citizen in 1844 added two pavilions. GOURLIER, etc., *Choix d'édifices*, fol., Paris, 1837-44, i, pl. 321-4. J. Peytret 1673 built the hôtel de ville from his design. (This would seem to be the same as François III.) LYON. 68.

VALGRE (signor ...); see VALDRE (signor).

VALHALLA. The German name for the building containing statues and busts of native heroes, erected at Donaustauf, six miles below REGENSBURG, commenced 1830 and inaugurated 19 October 1842; L. von KLENZE, architect.

VALIARREN (MARTIN DE), *aparejador* and maestro de arquitectura. M. de Gainza 12 March 1546 commenced the hospital de la Sangre at Seville, and dying 1555 it was continued by Valiarren, and after 1558 by F. Ruiz. 66.

VALLADOLID (Anc. Pintia; Vallisoletan; Belad-waled by the Moors; It. Vagliadolid). The capital of the province of the same name in Old Castile, and once the capital of Spain, situated on the river Pisuerga, over which is a bridge, *cir.* 1080 (L'ILLUSTRATION, August or Sept. 1858, p. 141, 393). The city was 920 taken from the Moors. It was formerly walled and had four gates; the Madrid gate is "locally much admired". Juan II (1406-54) resided there and it was then the finest city in Castile; Charles V (1519-58) and his son Philip II (1555-98) favoured it, and 1596 gave it the rank of a city; 1595 it became a bishopric; the court was removed by Philip III (1598-1621) to Madrid. Few places suffered more from the French. The *plaza mayor*, "large stupid place", has good edifices on arcades on three sides and the town hall on the fourth, it was 1567 rebuilt as at present by F. Salamanca and J. B. Toledo; others have piazzas formed with monolithic granite columns. A Moorish archway near the church of La Magdalena is built of bricks 11 ins. long by 7 ins. by 1½ thick, with mortar joints not less than an inch thick (STREET). The fine old palace of Fabio Nelli has a Corinthian court; the casa de Villasantes is the archbishop's palace; the casa de Sol has a good portal attached to a convent. No. 39 calle de S. Luis was the house of Juan de Juni, a sculptor, painter, and architect (died about 1614); Hernandez, painter, then purchased it and died 22 January 1636. The former sumptuous palace of the counts of Benavente is now the founding hospital. The doorway of the palace of count P. Ansuérez, now the hospital of Sta. Maria Esgueva, *temp.* Alonso VI, 1080, is given in BUILDER *Journal*, 1882, lxiii, 236-40.

The cathedral, dedicated to S. Benedict and the Assumption of the Virgin, founded 1118, was begun 1585 on a design by J. de Herrera (drawings of 1575-76 and the model still exist; the complete plan is given in PONZ). It was approved by G. de Vega; and carried out by J. de Salamanca, but only the nave, very plain, was completed; it comprises four bays, about 250 ft. by 150 ft., the piers being about 60 ft. from centre to centre north to south, and 45 ft. east to west. About 1730 the exterior and façade were altered by A. Churriguera, whose drawing is preserved: it is of granite, of the Doric order, having an arch 24 ft. by 50 ft. over the entrance. The only one built of the four towers fell in 1841, and has been rebuilt. The inlaid stalls by J. de Herrera were brought from the monastery of S. Paul. There is a large cloister on the north side of nave. In the sacristy is a silver *custodia* 1590, 6 ft. high, weighing 133 lbs. avoird., the masterpiece of Juan de Arfe. LLAGUNO, ii, 320-3, gives a long description of the edifice.

There are fourteen or sixteen parish churches:—

S. Pablo; 1286; partly rebuilt 1463, fine flamboyant portal; continued xvii cent.; restored after the French; the beautiful cloisters are destroyed.

S. Lorenzo; nave and sacristy 1602-8 built and repaired by J. Diaz del Hoyo for 2,500 ducats; works carried on by B. de Calzadas who constructed the portal.

S. Salvador; a good brick renaissance tower with gargoyles.

Sta. Maria Magdalena; 1570-76 capilla mayor and sacristy by R. Gil de Hontanón; F. del Rio *maestro de obras*, 1570 contracted to erect the body of the church and the tower after Gil's design for 6,400 ducats; 1571 tomb and 1577 retablo of bishop Pedro de la Gasca by E. Jordan.

S. Gregorio; xv cent., fine plateresque façade.

N. S. de la Antigua; *cir.* 1180-1200 lower part of nave and small tower, Lombard in form with northern moldings; for count Pedro Ansuérez; east end with three apses later; *cir.* 1230-44 west front; 1545-51 church by P. de Santisteban (plan in STREET); the roof richly groined; high altar 1556 carved by J. de Juni. On the north side are remains (three bays) of a Romanesque cloister with dog-tooth ornaments.

S. Nicolas, *cir.* 1080 for count Pedro.

N. S. de las Angustias; 1604 by P. G. de Mazuecos; façade by F. de Praves.

S. Julian; 1575. F. del Rio contracted to execute the chapel of Alonso de Vega el mozo; or by J. de Valdés.

S. Martin; founded 1148; has a tower 1148-1250; interior modern, Los Huelgas; handsome. La Cruz.

S. Marcos; *cir.* 1499, nave and aisles by J. de Arandía.

S. Antonio Abad or N. Señora; chief cloister and entrance by J. de Herrera; 1554 part of cloister and tower by J. de Ribera Rada; 1546 altar by G. de Tordesillas.

Most writers consider that S. Gregorio and S. Pablo are all that is worth seeing in the city.

The Dominican college of S. Gregorio; one of the noblest and handsomest specimens of religious Gothic art in the world; first stone 1488-96 by M. Carpiñero (died 1490) for cardinal Ximenes; a good Moorish window in the court; *patio* or *claustrum* in MONUMENTOS ARQUIT. DE ESPAÑA, fol., Madrid, 1859-86; and VILLA AMIL Y ESCOCURA, *España Artística* etc., fol., Paris, 1842-50, i, pl. 6; and in ii, the entrance; both the entrance (richly heraldic) and cloisters are better than those of S. Pablo; *artesonado* halls, once library, and the chapel; fine cloister staircase; now used as municipal offices. Colegio mayor de Sta. Cruz, founded 1479 (1480-92) or 1494, designed 1504-15 (handsome Italian) by H. de Egas (not by Olotzaga), on plan of a Greek cross, 300 feet long, not less sumptuous in its portals than in its ceilings to the church, and in its court; it is now the *musco*. Colegio de los Escoceses, formerly Jesuit college, founded 1627 for twenty, and 1771 transferred here. Colegio de los Ingleses founded by sir F. Englefield after the death of queen Mary of England, now for forty-five. N. S. del Prado; 1621 (?) third cloister and the façade of the *porteria*, by F. Velasquez and M. de Beyer; 1631 cloisters and monastery; arco que sala al Campo Grande by F. de Praves. S. Pablo; Benedictine church and monastery still in good order; 1442 with its façades about 130 ft. high, finished 1463 by J. and S. de Colonia, or G. de Siloe, or D. de la Cruz; *retablo mayor* and *silleria* of coro 1621 by F. Velasquez and M. de Beyer; great carving and of much merit; the stalls by Ferrara; the cloister a superb quadrangle, Pointed of xiv cent.

La Merced, monastery; 1629 cloister (Doric and Ionic) by H. del Hoyo and R. de la Cantera; cuarto nueva and refectory by F. de Praves. Portaceli y descalzos Franciscans; founded by Rod. Calderon; church and monastery by D. and F. de Praves; small but magnificent; fine retablo having four columns of serpentine; now the Dominican nunnery (Calderonas); founder died 1621. Los Agustinos Calzados; church finished 1598 by D. de Vergara. S. Ana; *cir.* 1760 by F. Sabatini. S. Benito el real; founded 28 Dec. 1389; elegant late Pointed, a lofty and richly groined roof; 1499 begun by J. de Arandía, builder; 1554 the fine tower and part of the cloisters by J. de Ribera Rada; the staircase on arches and columns, *cir.* 1720 by P. Martinez; continued 1731-42 by J. Ascondo, *maestro de obras*: the retablo and stalls 1526-32 by Perruete; it is now desecrated, the monastery being a barrack. Agostinos misioneros de Filipinas, 1759 church and monastery by Ventura Rodriguez.

The royal palace (purchased by Philip III, 1598-1621); noble *patio* with two cloistered galleries having busts of Roman emperors and arms of the provinces of Spain; suffered during the wars. Archbishop's palace in the casa de Villasantes. University or college of S. Pablo, founded 1346 by Alonso XI, is by Herrera or Churriguera xvii cent.; the *portada* is loaded with

massive statues of the sciences, and with rococo ornament; it now includes the colegio de los Irlandeses; a small Pointed cloister is beyond the main court. *Museo* in colegio de Sta. Cruz; contains the choir stalls of the convent of S. Francis in the first gallery; and fine Spanish sculptures in wood. A large hospital and seminary. Casa propia in campo grande, 1545 (?) by G. de Tordesillas. Chancilleria, large and fine, Tuscan Italian. Casas del consistorio, in plaza mayor, 1567-75 (?) by F. and J. de Salamanca.

In the environs is Simancas, situated on the river Pisuerga over which is a fine bridge of seventeen arches. The moated castle contains the national archives, placed here at the suggestion of cardinal Ximenes; there are forty-six rooms. The designs were prepared by J. de Herrera and F. de Mora; carried out by F. and J. de Salamanca and from 1578, Aug. 1, by P. de Mazuecos. P. G. de Mazuecos was *maestro mayor* in 1589, when the interior of the salone estado de Italia was designed by F. de Mora: D. de Praves succeeded 1607: and the granite porch leading to the second staircase was 1590 by H. Munal. Many churches and chapels were designed and executed under contract by R. Gil de Hontanón; and D. de Praves was *maestro mayor* 1607-20 at the royal residences in the environs of the city. PONZ, *Viage de España*, 8vo., Madrid, 1776-83, ix; xi, 38. CHAPUY, *L'Espagne*, fol. (1842). WARING AND MACQUOID, *Examples of Arch. Art*, fol., 1850. WELLS, *Pict. Antig. of Spain*, 8vo., 1846, p. 240-51. SAGRADOR Y VITORES, *Hist. de Val.*, ii, 181-6. STREET, *Gothic Architecture in Spain*, 8vo., 1865, p. 65-77. DEVERILL, *All round Spain*, 8vo., 1884, p. 210.

VALLADOLID (SIMON DE), 1567 worked at the Archivio de Simancas, near Valladolid. 66.

VALLANGOUYARD STONE. This stone, used for the fountains in Paris, is found in very large dimensions (FREEMAN).

VALLATORIUM. Late Latin term for a projection in a building.

VALLE (ANDREA DALLE), of Padua, designed the *certosa*, two miles from the city, sometimes attributed to A. Palladio, of whom he may have been a pupil. He published the unprinted works of Palladio, with eight plates, inserting five prints. He designed the duomo at Padua (renewed or rebuilt 1524 by J. (Tatti) Sansovino, and altered by Almerico); and restored the palazzo ducale at Venice, after the fire of 1577. BRANDOLESE, *Pitt., Scult., etc., di Padova*, 12mo., 1795, p. 123. TEMANZA, *Vite*, 4to., Venice, 1778. CADORIN, *Pareri*, 8vo., Venice, 1838, p. 41-4. 3. 12. 68.

VALLE (JUAN DEL), 1518 built the church of S. Salvador at Sta. Cruz de Tenerife, one of the Canary islands. 66.

VALLÉE (MARTIN DE LA), was employed by the empress Catherine II of Russia, as inspector of the royal works. Marot, David, and others engraved his works.

VALLÉE (MARIE DE LA), is said to have designed the great staircase of the palais d'Orléans, or de Luxembourg, begun 1615-20 by J. de Brosse, and to have been built by G. de Toulouse (now destroyed by Chalignin's work).

VALLÉE (SIMON DE LA); see LAVALLÉE (S. de).

VALLÉE (JEAN DE), born 1620, son of SIMON, was architect to Charles X and XI of Sweden, succeeding N. Tessin. He completed the ridderhuset begun by his father; the church of Hedvige Elénore; and designed the palace at Stockholm (burnt 1697); 1665 the tomb of Charles in the Riddarholm church; and the house for the freemasons at Stockholm. He died 1696. DUSSIEUX, *Les Artistes Français*, 8vo., Paris, 1856, p. 447-9. 68.

VALLEJO (JOSEF), maestro mayor of the alcazar at Seville, and of other royal works in that city at which he worked; died 1696. 66.

VALLEJO (JUAN DE). A native of Burgos or Bourgogne, 1512-3 was consulted at the cathedral at Salamanca; and 1514-24 did the renaissance gateway on the east side of the north transept; was 1539-67 *maestro mayor* at Burgos cathedral, where 1539-43 he rebuilt the transept on the fall of the

crucero, with J. de Castañeda the architect to the cathedral; 1542-47 visited the Premonstratensian monastery de N. S. de la Vid; Dec. 1567 finished the cimborio at Burgos, he having wrought under Felipe de Borgoña; and the triumphal archway in honour of F. Gonzalez at that city. FLOREZ, *España Sagrada*, xxvi. DUSSIEUX, *Les Artistes Français*, 8vo., Paris, 1856, p. 217. STREET, *Gothic Arch. in Spain*, 8vo., 1865. 3. 66.

VALLÉ LEDESMA, 1713-23 introduced the modern arches or light vaulting in brickwork, sometimes called the cupolas, in the *capilla real* of the cathedral at Cordoba. MURPHY, *Arabian Antiquities*, fol., London, 1813.

VALLÉ-RANFROY (JEAN DE) or Val-Renfroy. He worked at the cathedral of Sens; and received 10 livres pension. In 1342 he bought at Paris some stone. QUANTIN, *Not. Hist. LANCE, Dict. Biog.*

VALLERAS (ARNALDO DE), 1416 was "lapiscida et magister operis" at the cathedral of Palma, in Minorca; and was engaged in the construction of the church at Manresa, in Spain, nave 57 ft. wide (or 60 ft. from centre to centre of piers) and 110 ft. with aisles (that at Palma is larger; the plan nearly the same), and somewhat similar to Sta. Maria del Mar at Barcelona. He was 1416 consulted on the plan for the cathedral at Gerona. STREET, *Gothic Arch. in Spain*, 8vo., 1865, p. 340-1; 508. 66.

VALLEY (Fr. noue). The internal angle made where two roofs join.

VALLEY BOARD and GUTTER. See GUTTER; and GUTTER BOARD. LEAR BOARD. 1.

VALLEY PIECE or RAFTER (Fr. noulet or nolet; see *chevalet de Lucarne* in 5). "The backward hips or valley rafters in the way of an angle for the back part of a building"; MOXON, *Mechanick Exercises* (Carpentry), 4to., 1693, p. 159; 168. 1. 5.

VALLEY TILE (Sp. canal). The curved tile used in old tiled roofs in place of lead as at present fixed. Valleys were also formed by easing off each slope, so as to obtain a wide curve.

VALLFAGONA (PEDRO DE), before 1416 was "magister fabricæ" at the cathedral of Tarragona, and attended the junta of architects at Gerona in that year. 66.

VALLIN DE LA MOTHE, or Lamotte, chief architect to the empress Catherine II and Paul I (1762-1801) at S. Petersburg, where he designed many edifices in the style of Gabriel; as 1765-88 (Roman Doric) the impériale académie des beaux arts (completed by Feltern), and of which 1767 he was professor for many years; 1765 the petit Ermitage adjoining the Winter palace; the hôtel Oldembourg on the champs de Mars; and others. DUSSIEUX, *Les Artistes Français*, 8vo., Paris, 1851; LANCE, *Dict. Biog.*

VALLOMBROSA, properly Valembrrosa. This order of monks was a branch of the Benedictines of Cluny, and founded about 1070 by S. Giovanni Gualberto, a Florentine. It was confirmed 1055 by pope Victor II. The monastery near Florence, in central Italy, built 1637, was suppressed 1869, only four brethren being left to do duty in the church; the sacristy is lined with carved chestnut presses; the refectory will dine 200 persons at table. The order of nuns was 1153 established by a Bertha, the first abbess. 28. 96.

VALLOT (S...). In 1822 he made various modifications to the unfinished theatre at Dijon designed 1810-12 by J. Célerier, and opened 1828; it ranked next to that at Bordeaux. MAILLARD DE CHAMDURE, *Voy. Pitt. en Bourgogne*, fol., Dijon, 1833, i, 1.

VALLUM. The Latin term for a trench, fence, wall, bulwark, or rampart with palisades. Such was the work in Great Britain by Hadrian from the Tyne to the Solway frith; it was flanked by towers at regular distances; that by Agricola, temp. Vespasian, further north; that of Severus between the Clyde and the Forth; that of Stilico from the mouth of the Derwent to that of the Elme: with many others in various countries. 6. 25. 78.

VALMONTONE (Anc. Tolerium?) A town near Velletri,

in southern Italy, standing on a hill of tufa and surmounted by a baronial mansion, is surrounded by ruins of walls with square towers of the middle ages. There are remains of ancient walls of squared tufa; a sculptured sarcophagus of the time of Septimius Severus (193-211); and excavations in the rocks. The *Duomo*, dedicated to the Assumption of the Virgin Mary was designed *cir.* 1685 for prince Panfilii, by Mattea de' Rossi, a pupil of L. Bernini; it is elliptical in form with a fine campanile. The vast palace was built 1662 for a Panfilii, and lately restored by prince Doria Panfilii. On the hill above the town are the small church of Madonna delle Grazie, XI cent.: and the monastery of S. Angelo dating from XIII cent. 28. 50. 96.

VALSINIÈRE (... DE LA); see VALFENIÈRE (... DE LA).

VALTURIO (ROBERTO). To him is attributed the design of the castle at Rimini, and also to its owner prince Sigismondo Malatesta. 3.

VALUATION OF PROPERTY. This subject may be divided as follows:—1. Agricultural estates. 2. Building land. 3. Town property. 4. Ground rents. 5. Manufactories, trade premises, breweries, etc. 6. Collieries, ironstone and other mines. 7. Reversionary interests and advowsons; and 8. Sale of properties under compulsory powers. Rentals should be based on a fair letting. In 1868 consols yielded $3\frac{1}{2}$ per cent; at the present time $2\frac{1}{2}$ per cent; and "the Goschens" will be $2\frac{1}{2}$ per cent. For a readily negotiable security an investor should be content with 3 per cent. Agricultural estates with wood, water, and good game-cover and fishing, in England and Scotland, scarcely now yield 2 per cent. on the marketable value, from various causes. Town property generally yielded from 4 to 7 per cent. Ground rents from twenty-five years' purchase. Manufacturing property required much care in valuing, a margin for repairs and contingencies having to be considered. Other subjects yielded startling divergencies of opinion among surveyors, including property taken for railway and public purposes. Judgment, care, and accuracy, with common sense, were everything in favour of arriving at an honest result.

Agricultural land.—In estimating its value, strict investigation of the several points affecting the same, and not a mere calculation from previous rental, is required. The quality of soil generally, and if previously neglected, and capable of improvement by drainage or other means, its geological character, proportionate amount of buildings, state of fences, gates, and their general repair. The outgoings as deductions from rental, tithes, land tax, excess of rates over other districts, or special charges affecting owners. The advantage or disadvantage of access to property, quality of roads and proximity to railways, markets, etc. If minerals included with the property their probable value, subject to discount for the time that must elapse before marketable. Timber trees, plantations, fishings, and shootings, cost of labour and the supply of labourers' cottages in the district if sufficient or otherwise—if on the property they form an additional item of value—all these being fully estimated and a fair rental arrived at, the number of years' purchase will be determined by the facilities afforded for safe investment, government stock being the general standard adopted in making a comparison. In the vicinity of towns or manufacturing villages a demand is created for accommodation purposes; no rule can be laid down in these cases, many incidents lead to an increase of rental, and the probability of a future requirement for building purposes will also tend to an increase in the value as an investment. BAYLDON, *Val. of Property for Rating*, 8vo., 1834. BRIGHT, *Tables for valuing Estates*, 8vo., 1839. BAYLDON, *Art of valuing Rents and Tillages*, 5th edit., 8vo., 1846. DEAN, *The Land Steward*, 8vo., 1851. HUDSON, *Land Valuer's best Assistant*, 8vo. LANKTREE, *Elements of L. Val.; Qualifications and Duties of Valuers*, 8vo., Dublin, 1853.

House property.—This portion of the subject is differently treated and requires the experience of a building surveyor. The greatest item of variation is the value of the site, the price or

value per foot or per yard of the land in which the edifice stands, being satisfactorily ascertained; this will vary considerably in every locality according to its position. Then the buildings must be taken according to their worth, as sound or indifferent in execution, or highly finished; this will not vary by position; the cost of immediate repairs must be taken into consideration and deducted. From the amount thus ascertained a gross rental may be arrived at, from which after deducting the usual charges for landlord's outgoings, repairs, probable loss of rent, sewers rates and land tax (if any), etc., the net rental is produced; and this being subjected to the usual calculations according to the rate of interest required will show the value to a purchaser. The foregoing remarks apply to Freehold Property, but if Leasehold, the same system will apply, and the annual ground-rent will have to be deducted from the net rental, and the remaining amount capitalised to give the required interest on the purchase money, and to provide a fund for the return of the capital at the expiration of the term. This is easily obtained by the use of INWOOD'S or other *Tables* published for that purpose. LEYBOURN, *Complete Surveyor*, 1653; 1657; 1674; 1679; 1722: *Platform for Purchasers*, 1668; and *Purchaser's Pattern*, by H. Phillips; 1st edit. 1662; 5th 1676. GERBIER, *Council and Advice to all Builders, etc.*, 8vo., 1663. PRIMATT, *City and Country Purchaser*, 12mo., 1667; 2nd edit. by LEYBOURN, 1680. NEVE, *City and Country Purchaser*, 1736. HOPFUS, *Architectura Civilis*, 1738-48. SALMON, *Country Builder's Estimator*, 1770. RYDE and DONALDSON, *Text Book; and Landed Property*, 8vo., 1854. JONES, *Builder's Vade-Mecum*, 8vo., 1809. BIDEN, *Practical Rules*, 8vo., 1861 and 1862. LUMLEY, *Parochial Assessment*, 12mo., 1858. SCRATCHLEY, *Copyhold, etc.*, 8vo., 1859. TARBUCK, *Handbook of House Property; all kinds of Valuation*, 12mo., 1875.

Artificers' work.—To attain to any degree of accuracy in this valuation, a large practical experience is required; a knowledge of the way in which the various operations are carried out; and the separate value of labour and materials. A student who wishes to make himself proficient in this science should, for a short time at least, work at some of the most important branches of the building trade, and in other cases, carefully watch the processes by which the work is produced. In stonework especially, this knowledge is very essential, there being so much preparatory labour required before the desired result is arrived at; *plain faces* having to be produced in many instances before the work can be set out. The custom of lump contracts has nearly annihilated the system of measure and value (formerly universal) by properly qualified surveyors. To give a complete idea of the system would require a separate treatise, many such are published, but are not generally applicable, for local customs of measurement vary much, and it would be better, so far as possible, to bring all to a general system, subject to such variations as the use of local materials might call for, which would generally be slight. The student should, while carrying out his observations carefully note the average amount of time required to complete a certain portion of work, this being tabulated, he can ascertain the value of the labour at any time, according to the current rate of wages; he should also by dissecting and measuring arrive at the proportional amount of materials in a foot or yard of work as the case may be; these he can also tabulate and in a reasonable time will acquire sufficient data to enable him to price any kind of work, according to the existing value of labour and materials in the locality. The value of labour is determined by the master's price per hour and the materials by cost price delivered, with a percentage added for the master's profit. LANGLEY, *London Prices of Bricklayers' Work*, 8vo., 1750. MASTER CARPENTERS, *Prices of Journeyman's Measured Work*, 8vo., 1810. *Price Books* of 1787, 1794, etc., with SKYRING, *Builder's Price Book*, from 1806; and others by LAXTON; WEALE; and SPON by Young. BROWNING, *Proposed System of Valuing Carpenters' and Joiners' Work*, 8vo., 1847. DOBSON, *Student's Guide to the Practice of*

Measuring and Valuing Artificers' Work, 8vo., 1843; edit. by Tarn, 8vo., 1871.

S. J. B.

VALVER; VALUATOR. An authorised person employed to value property, personal or real, or of a claim in dispute, for an ascertained net value, as between two parties; or a simple valuation which may be and usually is, an *ex parte* opinion only and open to question. A surveyor who values property, or assesses a claim for dilapidations; or measures and values a tradesman's account for one party only, simply gives his opinion of the amount of the claim, which may be questioned by the adverse party. If he assess this as an arbitrator between two parties, or if he make a joint report with another surveyor as to the matter in dispute, or if he value for the purposes of an affidavit; or for administration under a will, or for legacy duty, or in any way in which his value is authoritative and final, he makes an "appraisement" and his report must be on stamped paper, and himself qualified by a licence, under a penalty of £50. **ANNUITY. APPRAISEMENT. COMPULSORY SALE. CONTRACT. COPYHOLD. DILAPIDATION. FREEHOLD. GROUND RENT. LAND. LEASEHOLD. RENT.**

S. J. B.

VALURING or *unluryng*; a parapet wall; see **ALURE**. 16. 17. **VALVA.** A former town, close to Pentima, about three miles from Popoli, in southern Italy; it arose on the ruin of Corfinium; the bishopric is now placed at SULMO or Sulmona. 23.

VALVA. A term used by VITRUVIUS, lib. iv, cap. vi and vii; its true meaning is open to doubt, but it is a leaf. ISIDORUS, *Orig.*, xv, 7, says, "*fores* open outward, *valvæ* inward; but popularly the use of the words is not distinguished": and unless the technical terms were confused PETRONIUS, *Satyr.*, xvi, distinctly shows that *valva* was a leaf and *ostium* a door, for he says *videbamus omnia per foramen valvæ quod paulo ante ansa ostii disrupta laxaverat*. Some writers have wished to show that *fenestra* was a window with a sill above the floor, but *valva*, a window down to the floor. **BIVALVE** or folding doors. A door with two leaves one of which folds back upon the other. **VIOLLET LE DUC**, *Dict. Rais.*, s. v. *Vantail*, ix, 346. **REPAGULA. REPLUM. SOCKET.**

VALVASORI (GABRIELE) of Rome, in the early part of XVIII cent., restored in bad taste the church S. Salvatore della Corte at Rome. The façade of the palazzo Doria Panfilii, on the side of the collegio Romano, is said to be by Borromini; the design was followed in the two other façades, that on the Corso by Valvasori, the other on the piazza di Venezia by Paolo Amati, producing together an assemblage of deformity; **LETAROUILLY**, *Rome Moderne*, 4to. and fol., Paris, 1840, p. 198, 201, pl. 58. *Illustrations*, s. v. Screen Wall, 1849-50, pt. 13, pl. 35, is that of the garden wall from the street, and exhibits the use of reversed balusters. He published *A Collection of Designs for Fireworks, etc., on a grand scale*, by V. Specchi, 55 pl., fol., Rome, 1724. He died about 1740. 3. 68.

VALVATA. VITRUVIUS, iv, 6, distinguishes doors as *biforæ*, *valvatæ*, and *quadrifores*; doors designed after the Atticurges style are not to be *clathrata*, nor *bifora*, but *valvata*, and should have apertures in the external parts. **POLENUS** supposes *valvata* to be single hung doors. **OVIN**, *Mét.*, ii, 4, speaks of *bifores valvæ*. **RICH**, *Companion*, supposes all doors or windows designated *valvatæ* to be hung style to style instead of to the jambs.

VALVE. A term applied to a SHUTTER as used at Torcello. The upper and lower halves of a lifting sash are called valves.

VALVE. An apparatus invented before 1845 by Dr. Arnott, for insertion in a flue for ventilating a room.

VALVE. An apparatus by which, in an hydraulic or pneumatic machine, the bore of a pipe or any orifice may be alternately covered and uncovered, in order in the one case to prevent, and in the other to permit, the passage of the fluid. The ordinary pump valve is frequently called a "clack". **BARBER**, *Engineers' Sketch-Book of Mechanical Movements*, 8vo., 1889, p. 198-208, gives diagrams of 74 valves and cocks of various types. **BURGH**, *The Slide Valve practically considered*, 8vo.,

ARCH. PUB. SOC.

1884, 11th edit. A "throttle valve" is balanced on centres, to regulate the flow in a pipe without disturbance by internal pressure of fluid. A blowing fan cannot give a blast under pressure, only in volume or quantity; so valves and immense volume are directly opposed to each other; as machines in which valves are used (not by valves) give blast only under pressure, hence the necessity of valves. 14.

A species of BALL COCK for shutting off water to a supply-cistern is called a "ball valve". Screw-down valves or taps are a late invention to meet the high-pressure or constant-supply system. **STOP COCK.**

The "valve closet" is so called from the bottom of the pan being shut up by a plate worked by a lever, instead of the "cup" of the old system, to retain water in the pan. "Valve water waste preventers" were at first called "regulators".

VALVE BOX. An opening in a pipe, pump, or engine, to enable a valve to be fixed or repaired; the opening must be closed by a planed metal plate having an air-tight joint, firmly fixed in position by screws. R. R. R.

VAMOUR and Vamer. The parapet of a bridge; **FULLER**, *History of Berwick*, 8vo., Edinb., 1799, p. 236. "The walke under foote, called the *vamer*, to be repayrede wt Cane stone by the masons"; **BAYLEY**, *History of the Tower*, 4to., 1821-25, pt. i, app. ix. 19.

VAN or WAN. A very ancient town in Asiatic Turkey, on the borders of Armenia. The few objects of interest are detailed in **LAYARD**, *Ruins of Nineveh and Babylon*, 8vo., 1853, p. 389-410; and **TEXTER**, *Arménie*, fol., Paris, 1842-52, pl. 35-39. 50.

VAN BODEGHEM (LOYS), or Beughem. See **BOGHEM (L. VAN)**.

VANBRUGH (sir JOHN), born 1666 probably in London or Chester, eldest or second son of GILES (died 19 July 1689 at Chester) and Elizabeth, a daughter of sir Dudley Carleton of Imber Court, Surrey, who died 13 Aug. (1711 or) 1713 at Chargate, in Esher parish, and was buried at Thames Ditton (LE NEVE, and Add. MS. 24.492). This GILES was the third son of Giles (died 1646) and Margaret and was buried in the church of S. Stephen's, Walbrook. In a letter to Tonson sir John intimates that he commenced life in the Bastille; but **RAYAISON**, *Archives de la Bastille*, 8vo., Paris, 1866, and **BINGHAM**, *The Bastille*, 8vo., 1888, i, 444, 450; the *Times Newspaper*, 8 March 1888, p. 4, show that sir John was imprisoned first at Calais, at Vincennes, and the Bastille, seized as a hostage, and subject to diplomatic correspondence, Sept. 1690 to 22 Nov. 1692, in which Louis XIV took part. **ASHPITEL** intimates that he was for many years in the army, having obtained a captaincy before he quitted it. The first notice of his professional life is "John Vanbrug armiger, contrarotulator operationum infra Anglicam 1 Anne 1702" (**JONES**, *Index to Records*, fol., 1793-95), by whose influence is unknown, succeeding W. Talman; again 6 or 7 January 1714-15, 1 George I; and 1718 sir J. V. comptroller at £250 per annum; May 21, 1715, appointed surveyor of the gardens and waterworks belonging to the royal palaces; he held both of these appointments until his death; he was succeeded by T. Ripley; and in 1726 N. Hawksmoor was appointed "deputy comptroller" presumably on account of sir John's ill-health. In the first list of the directors or standing committee at Greenwich hospital appointed under queen Anne's commission dated 21 July 1703 occurs John V. esq., who may have been the architect.

1703, see his theatre further on.

1703 June 26 appointed Carlisle herald extraordinary.

1703 writes to Tonson at Amsterdam to send him "a Palladio in French with the plans".

1704 March 29 appointed Clarendieux king-at-arms (**GENTLEMAN'S MAGAZINE**, 1836, vi, 27).

1714 9 Sept. or 19th (B. J., xx, 651) knighted at Greenwich house (**NOBLE**, *College of Arms*, 4to., 1804, p. 356).

1715 Oct. 17 appointed Garter principal king-at-arms, in place of sir H. St. George, decd.; after a long inquiry he gave this up to John Anstis

sen., who was appointed 20 April 1718, and sir John remained Clarencieux until 25 Oct. 1725 "when he sold it well" (G. M., 1837, vii, 483; elsewhere stated for £2,000; 26 June 1725 Knox Ward of Hackney appointed); and resigned 9 Feb. 1725-26 on finding that Anstis, jun., had a reversionary grant of Garter (NOBLE).

1716 Aug. 17 surveyor of the works at Greenwich hospital; succeeded by C. Campbell with a salary of £200.

1719 Nov. 29 lost the surveyorship of works, might have had it formerly (G. M., 1837, p. 244. B. J., 1862, xx, 60).

His attainments as a dramatist will be unnoticed in this article. He undertook entertainments as manager and proprietor (letters to Tonson, G. M., 1836, vi, 28); took a site on the west side of the Haymarket, and built a theatre. The works were begun on Monday after 13 July 1703, the first stone laid 18 April 1704 (sir W. LENNOX, *Celebrities I have Known*, 2nd Ser., 8vo., 1877, ii, 107, records the finding 1825 of the plate); it was opened 9 April 1705 (and burnt 17 June 1789). "As the house was built for singing, not for speaking, the audience could not catch the jest and sparkle (1707) of the dialogue" of *The Confederacy* (ATHENÆUM *Journal*, 1861, Jan. 19, p. 85); "the words were swallowed up by a spacious dome, beautiful to behold but which robbed the mind to gratify the eye", CUNNINGHAM, p. 269; KIRKMAN, *Life of Macklin*, i, 105-8.

Castle Howard, Yorkshire, for the earl of Carlisle, was begun 1701; "1703 new quarry found and 200 men at work" (G. M., 1836, p. 28), the main building 600 ft. long and east wing with offices adjoining and finished 1714 (west wing 1753 by sir T. Robinson). The obelisk set up MDCCXXI in the park records the commencement in MDCCXII. The plans dated 1714 in CAMPBELL, *Vitruvius Britannicus*, fol., 1715, i, pl. 63-71, and 1725, iii, pl. 5-6, do not appear to have been carried out especially at the ends of the garden front (compare prints in King's library, Brit. Mus.). NEALE, *Seats*, v. BROOKE, *Gardens of England*, 4to., 1858; ARCHITECT *Journal*, 1850, ii, 430. ILLUSTRATED LONDON NEWS, 1846, xiii, 236 view; 260 mausoleum by N. Hawksmoor; 1850, xvii, 181-7, full description with interior of great hall, and the lodge.

Blenheim palace, in Woodstock park, granted by queen Anne and confirmed 14 March 1705, for the duke of Marlborough. "As comptroller of her majesty's works Vanbrugh was appointed to prepare a model which her majesty kept in her palace"; D'ISRAËLI, *Curiosities of Literature*, 8vo., 12th edit., 1841; reprinted in ARCHITECT *Journal*, 1888, xl, 36-8; the "case" to which he refers is probably the Lansdowne MS., No. 817, p. 72, in Brit. Mus. On 1 June 1712 the queen ordered the payments to be stopped, the estimate of arrears being then £60,000; parliament voted £500,000 12 Anne for the queen's uses including this amount. The building not being completed at the duke's death 16 June 1722 he left £10,000 per ann. to his widow to continue the works. It is 348 ft. long, the hall 67 ft. high, the library 183 ft. 5 ins. by 31 ft. 9 ins. and a square of 28 ft. by 20 ft. at each end. "18 July 1707 Sarah would forgive him," *Letters* at Kimbolton; 11 June 1709, V. did not write to the duke—the duchess to give orders that the stables which are already covered should be finished—to hinder V. from beginning new foundations; *Private Correspondence*, i, 187; 1719, July 1, "Blenheim in a month will be ready for the duke" (G. M., 1836, vi, p. 376); and 1719 letter about his being deprived of £2,000 by the action of the duchess (G. M., 1836, vii, 244). The chapel was 1858 redecorated by S. S. Teulon; ECCLESIOLOGIST *Journal*, 1858, xix, 71. "The Building of Blenheim", letters in Brit. Mus. from N. Hawksmoor to H. Joynes comptroller (i.e., clerk of the works) at the building, 1705-22, abridged in ROY. INST. OF BRIT. ARCHITECTS, 1889-90, p. 12, 44, 60, 80, and 160; the *Add. MSS.* 19,591 to 19,618 all relate to the works at Blenheim; and 9123 to the works and action at law, Sarah, DD. of M., appellant v. Ed. Strong sen. and Ed. Strong jun., stonemasons employed on the building; the *Case* being in House of Lords, 27 Feb. 1723-4. *Bills* 1709-10 for works, B. J., 1880, xxxix, 743-4; also *receipt* 14 Nov. 1712 by sir John for £300 for services and expenses; S. I. Tucker, at Arch. Association 25 May

1853; *Journal of Archaeological Association*, 1854, p. 198. In sir John Soane's museum is a volume labelled "Account of monies issued and expended at Blenheim 1704-11, being copies of the orders for £233,000, and list of bills amounting to nearly £200,000; the order of 21 June 1705, and following ones, contains the important words "mansion house and gardens lately begun by the direction of the duke."

Private Correspondence of Sarah Churchill, Duchess of Marl., 8vo., 1838, i, 338-407, etc. *Letters from MSS. at Maitresfield Court*, 8vo., 1875. GENTLEMAN'S MAGAZINE, 1816, i, 37, 135; ii, 132, 411. MAVOR, *New Descr. of B.*, 8vo., Oxford, 1803. *Description*, 8vo., 1806. BREWSTER, EDINBURGH ENCYCLOPEDIA, 1830, pl. 179. NEALE, *Seats*, 4to., 1820, iii. CAMPBELL, *Vitr. Britt.*, fol., 1715, i, pl. 55-62; and 1725, iii, pl. 71-2. NEALE, *History of Blenheim*, 4to., 1823. COXE, *Memoirs—Correspondence from Family*, etc., Records, 3 vols., fol., 1818-9; new edition by WADE, 1847-48. KADCLYFFE, *Views*, etc., 16 pl., fol., 1842. MURRAY, *Handbook for Berks, Bucks, and Oxfordshire*, 1860.

1703, June 15. A house near Hampton Court for sir Goffrey (Kueller?) "in which V.'s room is done and a bed in it"; G. M., 1836, vi, 27.

1707, July 18. Kimbolton castle, Huntingdonshire, for duke of Manchester; rebuilt old garden front which had fallen down; mentions Hawkinson, and Coleman's drawing and work. ATHENÆUM *Journal*, 1861, *Letters*, p. 84.

1710 (?) Robin Hood's well, Doncaster; cover, for lord Carlisle.

1710 (?) Claremont old house, Esher, for himself, and sold cir. 1715 to duke of Newcastle who enlarged it. *Environ. of London*, 8vo., 1761, ii, 139. NEALE, *Seats*, iv. C. R. JONES, *Monograph of the Princess Charlotte of Wales*, 4to., 1885, pl. 12 (13 and 15); BRAYLEY, *Survey*, 4to., 1841, ii, 440, 449. CAMPBELL, *Vitr. Britt.*, fol., 1725, iii, pl. 77-8.

1711-18 Oxford; the Clarendon printing office, used in 1875 for the university police and for meetings. DALLAWAY, *Anecdotes of the Arts*, 8vo., 1800, p. 103. ACKERMANN, *Colleges of Oxford*, 4to., 1814, ii, 238.

1713 finished. King's Weston, near Bristol, for lord de Clifford. BLACKER, *Gloucestershire Notes and Queries*, 8vo., 1881-4, ii, 359. NEALE, *Seats*, 4to., ii. CAMPBELL, *Vitr. Britt.*, fol., 1715, i, pl. 47-48.

1713-18 Duncombe park, Yorkshire, for Charles (?) Duncombe now lord Feversham, carried out by W. Wakefield. Additions 1844-5 by sir C. Barry; slightly damaged by fire 31 Oct. 1868; burnt before 1884. CAMPBELL, *Vitr. Britt.*, fol., 1731, iii. NEALE, *Seats*, Ser. 2, i. BRITTON, *Beauties of England*, xvi, 272. BURKE, *Visitation*, i, 2.

1714 Cambridge. Works to hall and combination room of Magdalen college, same as at Audley end; WILLIS and CLARK, *Arch. Hist. of Cambridge*, 4to., 1886, ii, 382.

1716-1718 Eastbury, Dorsetshire, and several temples there, for Bubb Doddington. CAMPBELL, *Vitr. Britt.*, fol., 1725, iii, pl. 15-19. Pulled down by earl Temple.

1716 Oulton hall, Cheshire. TWYCCROSS, *Mansions*, 4to., 1847-50, iv.

1716 House for a person of quality in Somersetshire (or Dorsetshire). CAMPBELL, *Vitr. Britt.*, fol., 1717, ii, pl. 52-55.

1716-26 Greenwich hospital, centre of the more southern range of the west front, in red brick. G. M., 1815, ii, 494.

1716 (?) Greenwich. Two houses east side, now called Vanbrugh park, one bearing north; Bastile on Maize hill, sold after his death to lord Trylawny; also called "Minced Pie house"; G. M., 1815, lxxxv, i, 326; and "Ivy house, his country residence with a large mansion near". Drawings by T. L. Donaldson at R.I.B.A. Also five small brick conduits in the park, *idem*, i, 517, 519.

1717 Chatham, store houses, query by him.

1718 Fleurs or Floors, near Kelso, for duke of Roxburgh (enlarged by Playfair). PENNY MAGAZINE, 1815, xiv, 350. NEALE, *Seats*, vi. JONES, *Seats*.

1719 Stowe, Buckinghamshire, for duke of Buckingham. Nelson's seat: the Ionic rotunda or temple to Bacchus; the Boycoat pavilions (altered by Bora); temple to Venus; the Doric pavilions at south entrance to gardens; and "a very great number of structures in these gardens"; where Aug. 12, 1725, he stayed a fortnight with lord Carlisle's party (G. M., 1836, vii, 376; 482). A pyramid 60 feet high was erected to the memory of Vanbrugh. BICKHAM, *Beauties of Stowe*, 8vo., 1753; new edit. by SEELEY, 1769. *Description*, 8vo., 1838. NEALE, *Seats*, 4to., 1816, i.

1720 Drummonds, for Mr. Yorke.

1720 Seaton Delaval, Northumberland, for Francis Delaval, esq.; burnt about 1824 and still in ruins. CAMPBELL, *Vitr. Britt.*, fol., 1725, iii, pl. 20-21.

1721 Audley end, Essex. He destroyed three sides of the greater quadrangle; WALPOLE, *Anecdotes*; designed the present screen and

- staircase at south end of great hall, BRITTON, *Arch. Antiquities*.
 JONES, *Seats*, iii. NEALE, *Seats*, i.
 1722-24 Grimssthorpe, Lincolnshire, for the first duke of Ancaster, now lord Gwydir. The north front, an important work. CAMPBELL, *Vitr. Britt.*, fol. 1725, iii, pl. 11-14. NEALE, *Seats*, ii. JONES, *Seats*, 4to, i.
 ALLEN, *Lincolnshire*, 4to., 1834, ii, 295.
 — Kensington Palace green, Water Tower; G. M., 1815, vol. 85, i, 423; and the Charity school (*idem*) in Mayfield place.
 — Benningboro' hall, Yorkshire. BREWSTER, in *Civil Architecture* in EDINB. ENCYC., p. 647.
 — Gilling Castle (Rysdale) near Helmsley, Yorkshire, seat of C. G. Fairfax, esq., remodelled with the exception of the keep and other portions; carried out by W. Wakefield, resident architect or builder.
 — Whitehall. His town residence in Scotland yard, G. M., 1815, i, 423, out of the ruins of Whitehall after the fire of 1697. It was ridiculed by SWIFT. Drawing in volume at S. K. museum by C. J. Richardson, 1806.
 — Dyrham house, near Bath; curious waterworks.
 — Hawkeston park, Shropshire; great alterations for sir Rowland Hill; a bust over a picture of whom is considered to be sir John V. NEALE, *Seats*, 4to., 2nd Ser., iii.
 — Cholmondeley castle, Cheshire; rebuilt part. Pulled down 1801 or 1804. NEALE, *Seats*, Ser. 2, v. TWYCRoss, *Mansions*, 4to., iv, 19. CAMPBELL, *Vitr. Britt.*, 1717, ii, pl. 31-34, gives old building.
 — Chetle, Dorsetshire. Pewing in old church, now pulled down; and manor house. ILLUSTRATED LONDON NEWS, 1849, xv, 285.
 — Morpeth. Town hall (attributed). Drawings by B. Ferrey at Roy. Inst. Brit. Architects, *Report*, 1848, p. 20.
 — Iver grove, Buckinghamshire, for lady Mahon, lately by lord Gambier: ACKERMANN, *Repository of Arts*, 8vo., 1834, iii, 126, view.
 — Old Eaton hall, Cheshire. NOTES AND QUERIES *Journal*, 1856, Ser. 2, i, 117. CAMPBELL, *Vitr. Britt.*, fol. 1715, ii, pl. 35-6. Rebuilt (?) by W. Porden, *cir.* 1805.
 — Addiscombe or Edgcombe house, near Croydon, now Royal East India college, purchased 1809; LYSONS, *Environ.*, Supp., 4to., 1811, p. 21.
 — Deptford; S. Paul's parsonage; triangular with an octagon at each angle; LYSONS, *Environ.*, Supp., 4to., 1811, p. 388.
 — Somersby hall, Lincolnshire, attributed. BUILDING NEWS *Journal*, 1865, xii, 520.
 — Footsray. Neald hall.
 — Church of S. John's, Westminster, attributed, but is by T. Archer. G. M., 1816, ii, 518; 1817, i, 8.
 — Woolwich, attributed. The original foundry at the Royal Arsenal. Great pile of building at Tower place. Gate near the Thames for the ship-carriage house, etc.; Brit. Mus., *Cat. of King's Library*.
 — Easton Neston, Northamptonshire, is 1713 by N. Hawksmoor.
 — Christ's Church, Spitalfields, is 1723-29 by N. Hawksmoor.

In the library of South Kensington museum are two volumes of drawings and tracings containing a ceiling, etc., attributed to sir John, by C. J. Richardson. (Are any others known? N. AND Q., 1864, Ser. 3, v, 498.) No pupils are mentioned: he was greatly assisted in his works by N. Hawksmoor.

He died after a long illness (quincy writes ASHPITEL) 26 March 1725-6 at his residence in Whitehall; and was buried 31st in the family vault in north aisle of S. Stephen's, Walbrook (B. J., 1856, xiv, 60). His widow, a daughter of a Yorkshire family, died 26 April 1776, aged 90 (G. M., xlv, 240; ANNUAL REGISTER, p. 224), or as stated by ROBINSON, *Priory of Snaithe*, 1861, p. 77, on 22 April, aged 86. A son John was buried 28 March 1723 at Walton-on-Thames (BRAYLEY, *Surrey*, 4to., 1841, ii, 379); his (only ?) son Charles, an ensign in the 2nd regiment of foot guards, was killed near Tournai May 1745 or 1746, aged 26. An engraved portrait 1733 by Simon after sir G. Kneller; portrait by Richardson in *Heralds' College*; a portrait by Kneller was sent 1867 by W. R. Baker to the Second portrait exhibition at South Kensington.

Essays on his works and genius. BUILDER *Journal*, 1860, xviii, 460. REYNOLDS, *Discourses*, xiii, 1786. GWYNN, *London and Westminster Improved*, 4to., 1766, p. 43-5. THOMSON, *Original Composition in Architecture*, read 1840 at Royal Institute of Brit. Architects; in CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 261. HUGGINS, in B. J., 1878, xxxvi, 666. GILPIN, *Northern Tour*. UVEDALE PRICE, *Essay on the Picturesque*, ii, 211. HUNT, *Architectura Campestre*, 4to., 1827, ix. CHAMBERS, *Civil Architecture*, edit. by Gwilt, 8vo., 1825, p. 306.

Letters 1703-19 from V. to Tounson the bookseller, in GENTLEMAN'S MAGAZINE, 1836, New Series, vi, 27, 376. CUNNINGHAM:

in BUILDER *Journal*, 1856, xiv, 60; and 1862, xx, 601; 651. *Letters at Kimbolton*, in ATHENÆUM *Journal*, No. 1734 for 5 January 1861, p. 19 and later. CUNNINGHAM, *Life of V.*, in *British Artists*, etc., 8vo., 1836. WALPOLE, *Anecdotes of Painting*, 8vo. edit., 1862, by WORMUM, iii, 297. *Life* prefixed to the Plays, 8vo., 1776, which does not mention his architectural works. DAVENPORT, *Biog. Dict.*, p. 546. CHAMBERS, *Book of Days*, 8vo., 1864. ASHPITEL, *Life*, in ENCYC. METROP., 8th edit., 1860, which is preferable to that in the 9th edition. NICHOLS, *Selections*, iv, 337, good account. PAPWORTH, *Life*, in NOTES AND QUERIES *Journal*, 1872, Ser. 4, ix, 499. See also Ser. 1, i, 142, London improvements, drains, 1722. Ser. 2, i, 7, Cunningham: i, 116, Will of Giles: xi, 326, musician (?): Ser. 4, x, 17, Lady V. and her Will. 3. 14.

VAN KAMPEN (J. and N.). See KAMPEN (J. and N. VAN).

VAN CLÉEMPOTTE (PIERRE LOUIS), born 28 March 1758, at Paris, was a pupil of Gabriel. He competed several times for the grand prix; in 1795-96 as architect to the government he directed the fêtes; and was "adjoit" to the works at the prisons under St. Hubert; he competed for the tomb of Desaix; was a member of the école des Beaux-Arts; had many pupils and was living in 1830. It was probably this architect who with PRIEUR published *Collection des Prix de l'Acad. d'Arch.* depuis 1779, 120 pl., fol., Paris, 1786. HERLUISON, *Actes d'état*, 8vo., Orleans, 1873, p. 439. 110.

VAN CLÉEMPOTTE (LUCIEN TIRÉ), born 15 May 1795, at Paris, was son of PIERRE LOUIS, and a pupil of Percier. In 1816 he gained the grand prix; proposed the restorations of the temples of Vesta at Rome and Tivoli; and of Hercules at Rome; the theatre of Taormina in Sicily; the forum of Trajan; and temples of Venus, and of Concord, with others. In 1820-22 he accompanied Forbin and Hackerblac to Sicily; their account was published. He designed the tomb to the duc de Plaisance in the cimetière de l'Est; and several projects for the préfet; with others for the embellishment of Paris. He was architect-voyer of the department of the Seine, of the cour des Comptes; inspecteur of the works of Ste. Elizabeth with others. He designed 183 x, halle aux grains, at Dourdan, Seine et Oise (ii, pl. 248); 1849, Archives de la cour des Comptes at Paris, rue de Lille (ii, pl. 380-1); both given in GOURLIER, ETC. (as above); and 1833, Pavillon at a house, rue Hauteville (i, pl. 65-6); 1835, house, allée des Veuves (ii, pl. 48-50); 1839, orangery at Clamart (ii, pl. 113), given in NORMAND, *Paris Moderne*, 4to., Paris, 1837, 1845.

VAN CLÉEMPOTTE (HENRI), designed 1823, tribunal de première instance, at S. Lô, in Manche (i, pl. 37); and 1828, tribunal civil at Valonges, in Manche (ii, pl. 196-7), of GOURLIER, ETC., *Choix d'édifices*, fol., Paris, 1825-50: 1832, house Terrain Belle chasse, No. 9 (i, pl. 44-5); and house, Rue de Londres No. 25 (ii, pl. 48-52), of NORMAND, *Paris Moderne*, 4to., Paris, 1837-45, i and ii.

VAN DEN BERGHE (JAN), also called Jan van RUYSBROECK, born 1415, was January 1448-9 appointed "meester van den steenwerk van den torre; and 1444-54 (not 1402-10 as stated on a medal in the collection of the Roy. Inst. of British Architects), designed the left wing, and the octagonal upper part of the tower 330 ft. high, of the hôtel de ville at Bruxelles; the date 1444-87 is ascribed to H. Gheerys (perhaps as builder). As master mason at the church of SS. Michel and Gudule he may have executed the vaulting of the nave; he rebuilt 1470-82 (except the old crypt) the collegiate church of SS. Peter and Paul at Anderlecht, near Bruxelles; the tower and west front date 1506-27 (its restoration was begun 1845 by M. Suis); and he was appointed master mason to the house of Bourgogne. He was alive in 1482 (WEALE, *Handbook to Belgium*, 8vo., London, 1859, p. 41, 46, 69), and is supposed to have died circa 1485. MESSAGER DES SCIENCES, ETC., *Hist. de Belgique*, 8vo., Gand, 1841, p. 229-33.

VAN DEN BOSSCHE (GILLES), called JOES; died 1459; *Guide to Bruxelles*, p. 57, 105.

VAN DER STRAETTEN (J. or C.). See STRAETEN (J. or C. VAN DER).

VANDONI (GIUSEPPE), appointed 1860 to restore and complete Milan cathedral; up to 1863, 7,000 statues had been placed, and 3,000 more were said to be required to fill the pedestals, etc. (incomplete in 1870). A. P. S.

VANDYKE or VANDYCK BROWN. The "Campania brown" of old Italian painters. Cappagh is a manganese peat, obtained from near Cork in Ireland. Rubens is a native earth of an ochreous character. Cassel or terra de Cassel is an earthy brown used by the great painter Vandyck; this mixed with burnt lake and a little Prussian blue, gives a profound black. Cologne brown, incorrectly called Cullen's earth, is an ochreous deep violaceous earth, and is considered to be fugitive. These are all bituminous ochres, and afford a fine, deep, semi-transparent brown, good for glazing. They are nearly permanent both in water and oil; to compensate for the action of strong light, they should be mixed with permanent colours, as umber, Chinese black, and oxide of iron. Being earthy, they are liable, unless very well washed, to possess unwonted substances. The strongest drying-oils should be used with them. STANDAGE, *Artists' Table of Pigments*, fol., 1883. 9.

VANE, fane, and phane (Fr. *girouette*; Ger. *windfahne*). A banner-shaped plate of metal, or a weathercock, placed on a pivot on the high part of a building, to show the direction of the wind. Anciently the nobility had the liberty given them of setting up vanes over their houses; some authors assert that none could attain to that honour who had not been foremost at scaling the walls in an assault on some city, or had first planted their banners or pendants on the ramparts. Vanes were at first painted with armorial bearings, and represented the banners or pendants of nobility. S. PALAYE says, that none but those who were nobly descended had the privilege of expressing on their flags, or of blazoning, the achievements of their houses. The arrow, cock, and flag or banner, are common; the four banners on the Tower of London are each surmounted by a crown. The "cock" of the spire of Norwich cathedral is 27 ins. high and 3 ft. 2 ins. long, as is also the cross-bar and top stone of the spire, which is a half sphere and a channel about it. The cock appears at S. Katherine Cree; S. Stephen, Coleman street; and Central markets, Smithfield, where it is 4 ft. 6 ins. high and nearly same in length from bill to tail. A "ship" to S. Mildred, Poultry, was removed 1873, to S. Olave's, Jewry, and 1890 to; one (formerly) on S. Bartholomew, Royal Exchange; S. Paul, Dock street, Whitechapel; Wellclose square School; and S. Michael Queenhithe, which held a bushel of grain. A "key" to S. Peter upon Cornhill, is 8 ft. 8 ins. long, the wards 18 ins. high by 24 ins. across; the bow is 2 ft. from bottom to top. The "dragon" to S. Mary-le-Bow is over 9 ft. long; the "grasshopper" to the Exchange is 11 ft. long; a "gridiron" to S. Lawrence, Jewry; an "arrow" on S. Botolph, Aldgate; and an "anchor" on S. Clement Danes. The shield of the city with sword, at the new City of London Courts (1889). *Vane and Weathercock of London Churches*, in *BUILDER Journal*, 1855, xiii, 123-4, shows some of these vanes. *Heraldic Vanes* in *NOTES AND QUERIES Journal*, 6th Ser., vi, vii, viii. *BRITISH ARCHITECT Journal*, 4 May 1888. *Illustrations*, Metal work, Ridge. 16. 17. 19.

VAN HECKE. System of warming and ventilating hospitals, is well detailed in *BUILDER Journal*, 1859, xvii, 435.

VANHEKMAN PAINT. Fish oil rendered applicable for painting, producing an impenetrable anticorrosive paint for outside work. It was explained at the Society of Arts, and its various combinations and preparations reprinted in PARTINGTON, *Builder's Complete Guide*, 8vo., 1825, p. 569-74. He published *Every Man his own House Painter and Colourman*, 8vo., 1827, and 1829.

VANISHING POINT. That point on the plane of delineation to which two or more lines will converge, when they are

the perspective representations of two or more parallel lines in an original object, whose seat is inclined to the plane of delineation. There is always a right and a left hand vanishing point; and sometimes an accidental vanishing point arising from some inclined line in the object. The points when found on the ground line are transferred to the horizontal line of the drawing. A vanishing line is one supposed to be made on the picture by a plane passing through the eye of the observer parallel to any original plane produced till it touches the picture. 1.

VANNE (RICHARD DE), abbot of S. Vanne, designed many churches, and the bell tower of the monastic church; MABILLON, *Acta S. Ord. S. Bened.*, iv, 451; RAMÉE, *Hist. Gén. de l'Arch.*, 8vo., Paris, 1843, ii, 135.

VAN NERVEN (C.). See NERVEN (C. van).

VANNES (supposed Doriorigum; capital of the Veneti). A seaport in the department of Morbihan, in Brittany. It is walled and has narrow streets, with houses having projecting stories; "porte prison" or "porte pater" is the most interesting of the gates. The large "tour du connétable" or de Clisson about 1387, is now used as a museum for Celtic and other antiquities. The bishopric dating from v cent. is now suffragan to the archbishop of Tours. The cathedral, dedicated to S. Peter, dates from xi cent.; it has a nave with five chapels on each side, and is said to resemble the neighbouring abbey church of S. Gildas de Rhuys; it was sixty years in building; the chapel of S. Sacrement dates from before 1540; and that of S. Vincent Ferrier dates 1420. It has a lofty but not elegant spire. MACQUOID, *Through Brittany*, 8vo., 1877, p. 72-93. SOUVESTRE and NANTES, *La Bretagne Pitt.*, fol., Paris (1841), gives the picturesque prison gate. STOTHARD, *Letters during a Tour*, 4to., 1820. TAYLOR ET NODIER, *Voyages Pittoresques* (Bretagne), fol., Paris, 1845-6, p. 173, gives the tower and some old houses. 14. 28. 50. 96.

VANNI (JEAN BAPTISTE), painter, of Pisa, learnt architecture of Giulio Parigi, of Florence. He died 1660, aged 61. 5.

VANNI DI UGOLINO (GIACOMO DI), of Siena, designed 1334-42, the fonte Gaja in the place del Campo; the sculpture 1412-19 was by Giacomo della Quercia; FAMIN and GRANDJEAN, *Architecture Toscane*, fol., Paris, 1806; 1837; and 1875, pl. 92. It was renewed 1869. (SIENA.)

VANNONE (ANDREA). A native of Lancia in the Comasco, he removed to Genoa, where 1590-1 he designed the enlargement of the small palazzo or former ducal palace (erected 1292 by M. Bocanegra), extending it in the rear, adding a vast lobby flanked by two courts each with two galleries; a spacious staircase leading to the armoury, and the audience hall; the *salone* is about (150 ft. by 57 ft.) 123 ft. by 52 ft. 6 ins., by 65 ft. 6 ins. high. The roof was burnt 1684; and again Nov. 3, 1777; the *salone* was arched with brick with other works, by S. Cantone. GAUTHIER, *Genoa*, fol., Paris, 1818, pl. 6. MILIZIA says "there is a book of the designs of this work", meaning in MS., at Genoa: and has confused him with Rocco Pennone. RASCHDORFF, *Palast Architekten*, fol., 1886, pl. 87, gives 1600 the Villa Paradiso in S. Francesco d'Albaro at Genoa, as his work. At Sarzana he excavated a large cistern in a piazza, and was employed by the republic in fortifications and other works. 3. 37. 68.

VANOCCI (FRANCESCO DI GEORGIO), seems to be the same person as MARTINI (F. DI G.), of Siena.

VANSANZIO (GIOVANNI), and Van Santen, properly Jan van Zant. See SANTEN (J. van).

VANT. A roof over machicolations, or the advanced portion of military works; NARE, *Glossary*.

VANTINI (RODOLFO), studied at Rome; designed the porta Orientale at Milan, of which a medal was struck in 1827. At Brescia he commenced the campo santo with its chapels, having a dome 30 ft. diameter; and its *faro* in 1855, of which engravings are in the library of the Roy. Inst. of Brit. Architects, presented by the architect; who also completed 1825 the great

dome by G. Lantana to the cathedral of the city. He was buried 19 December 1856, aged 65. ZAMBELLI, *Esequie delle R. V.*, Svo., Brescia, 1857. 28. 68.

Another R. Vantini rebuilt 1520 the church of Sta. Maria Maggiore, of red marble, at Trento.

VANVITELLI (LUIGI), written Wanvitelli in some books, was a son of the painter Gaspare van Witel of Utrecht, who practised in Italy (died 1736); his son was born 1700 at Naples and when only twenty decorated at Rome a chapel with frescoes. He studied under F. Juvara, and 1726 was appointed architect to S. Peter's church, carrying out works of decoration. At Urbino he restored the palazzo Albani for the Cardinal di S. Clemente, and designed the churches of S. Francisco, and of S. Domenico. Together with N. Salvi he conducted water from Vermicino to Rome, and designed the necessary buildings. He competed for the façade to S. Giovanni Laterano, making two designs, one of which with one by Salvi were chosen (out of the twenty-two sent in competition); but the pope deciding in favour of one by A. Galilei, the two former were compensated, the first by the frontispiece to the fountain of Trevi at Rome, while Vanvitelli had works at Ancona, where he extended the mole, designed the triumphal arch upon it, and 1773 designed or continued the pentagonal lazaretto (said also to be by G. Dosi), assisted by C. Murena, having studied those of Leghorn, Genoa, and Venice; made designs for a chapel in the cathedral to contain the relics of S. Ciriaco; for repairing the church del Gesù, rebuilding that of S. Agostino leaving the interesting doorway; and the casa degli Esercizi Spirituali. He made designs or restorations, 1735 at *Macerata*, the capella di Sta. Maria della Misericordia; *Perugia*, the church and monastery of the Olivetani; *Pesaro*, the church della Maddalena; and 1740-58 *Loreto*, the lofty campanile with pyramid, to the palace finished under Benedict XIV (1740-58).

At Rome, he designed additional rooms at the Gregorian university (Roman college), for the fine bibliotheca Angelica, founded 1605, considered the third library in Rome as it has nearly 90,000 volumes and 2,945 MSS. 1740-50 he thoroughly restored the church of S. Agostino in piazza di S. Agostino (designed 1483 by B. Pontelli), and rebuilt the superb monastery (LETAROUILLY, *Rome Moderne*, fol., Paris, 1840-50, p. 351, pl. 157). He is supposed to have given the alarm about the failure of the dome of S. Peter's, and 1742 with G. Poleni placed the iron bandages in thirty pieces; DUMONT, *S. Pierre*, fol., 1763, pl. 54. He declares himself the author of the movable scaffold for repairing the interior of the dome, others give it to N. Zabaglia. For 1750 he arranged the decoration of the tribune in S. Peter's; the illumination of the dome in a new style; 1735 the catafalque for the obsequies of C. M. Sobieski so-called queen of England; and the removal of the pieta of M. A. Buonarroti. 1749 for pope Benedict XIV he remodelled the church ("della Certosa" designed by Buonarroti) of Sta. Maria degli Angeli, piazza de' Termini, the Carthusian monastery, where he reopened the gate and three arches of the grand hall; made designs for other decorative works; and added the circular arch of the baths of Diocletian as a vestibule, arranging in it four mortuary chapels (MILIZIA, i, 289; LET., p. 657-8, pl. 316). Designed the plan of the church of S. Andrea delle Fratte (LET., p. 325, pl. 142).

1750-77 for Lisbon, in the church of S. Roque of the Jesuits, he designed at Rome the entire works for a chapel of S. Jaõa Baptista, which were put up, removed to, and fixed in Lisbon (a full description is given s. v. LISBOA). 1744 for Milan cathedral he made a design for the façade, not carried out (FRANCHETTI, *Diomo*); and 1770 made another design with C. G. Merlo for the façade. He restored the palazzo di Corte, with other works in the city; and 1760 (or 1790?) continued with G. Piermarini, L. Pollack's design for the archduke's new palace. 1750 at *Frascati*, made alterations and repairs to the palazzo Rufinella, belonging to the Jesuits. At *Mercogliano*, the ospizio. At *Resina*, the casino Campolieto. At *Matalone*, an altar and pix.

ARCH. PUB. SOC.

Invited 1751 to Naples by Carlo III he restored the chief façade of the palace; designed the cavalry barracks near the porta Maddalena carried out by his son-in-law F. Sabbatini, with the arsenal armoury; the chiesa (burnt 1757) Sta. casa and ospedale della SS. Annunziata; S. Marcellino or (repaired 1767) di Pietro d'Apuzzo; the chiesa della Rotonda; the chapel, sacristy, and staircase of the conception of S. Luigi di Palazzo; 1757 the Doric colonnade to the largo dello Sto. Spirito or largo del Mercatello, for the equestrian statue of Carlo VII (unfinished 1875), or forum Carolinum; with many other palaces and houses; the great gate, staircase, and façade of the palazzo Calabritto a Chiaja; 1770 the palazzo Casacalenda (also attributed to M. G. Gioffredo); 1770 palazzo Fondi, formerly Gensano al fontana Medina; 1770 restoration of the palazzo arcivescovile; and 1773 the palazzo d' Angri, finished by his son Carlo. 1755-73 at *Siena*, he restored the church of S. Agostino, spoiled later by other hands. 1767 near *Benevento*, the bridge of six arches over the river Calore. At *Brescia* 1769 the palazzo ducale, pubblico, municipale, or della loggia (ZAMBONI, *Pub. Fabb. della Città di Brescia*, fol., Brescia, 1778, p. 99, etc.). 1770 at *Foligno* renovated the cathedral, works carried on by G. Piermarini. A short time before his death he had to pay 5,000 crowns for having miscalculated the cost of the repairs to the Acqua Felice at *Pantano*, which amounted to over ten times his calculation (MILIZIA). He further designed for the wedding of the reigning sovereign of Naples the external decorations of the palace, the dining-room, and all other embellishments in the palace of the princes of Teora; in which town the ambassador from Vienna, the count Kaunitz, celebrated the same event by great festivals. Also at the first accouchement of the queen, by the duke of Arcos of Spain.

His greatest work was the palace at *Caserta*, near Naples, with its aqueducts, etc. It was begun 28 January 1752, and he was assisted by C. Murena, and his son-in-law F. Sabbatini as second overseer of the works. It is usually considered one of the finest palaces in Europe; also "a heavy cumbersome mass without any play of outline in the elevations"; and "wretched in design". The south side is 746 ft. Engl. long, 576 ft. wide, and 113 ft. high (also called 780 ft. by 600 ft. by 125 ft.: also 803 ft. by 623 ft., according to the Naples Guide, 1826); there are five, seven, or eight floors each having thirty-seven windows in front. The principal court is 507 ft. long; from the centre, where the four courts form a cross, springs the grand staircase, admitting twelve persons abreast, the walls are inlaid with lumachella of Trapani; the great vestibule at the top is ornamented with rich marbles and columns of Sicilian breccia. The chapel resembles that at Versailles, and is rich in marbles, lapis lazuli, and gilding. The theatre, having alabaster columns, has five rows of boxes; its sixteen Corinthian columns of African marble were brought from the temple of Serapis at Pozzuoli; they form a regular architectural range of proper proportions in place of the common iron ones. The palace is built of travertine from the quarries of S. Jorio, near Capua. The gardens are delightfully laid out; the cascades, forming a combination of fountains and statues, are supplied by the aqueducts designed by L. Vanvitelli 1753 or 1759-64, comprising a bridge of three arches at Taburno, three arcades at Durazzano, and at Garzano a bridge of three stages 1,618 ft. long and 178 ft. high (Aqueduct, in *Detached Essays*, 1852, pt. 2, p. 12, and pl. 2, figs. v and vi: also in INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 1855, xiv, 234). The curious grotto is also described s. v. Grotto (VANVITELLI, *Dichiarazione dei disegni del R. pal. di Caserta*, fol., Nap., 1756. ROSSINI, pl. 71. TAPPEN, *Observations*, Svo., 1806, p. 256. SMIRKE, *Specimens of Continental Architecture*, fol., 1806, pl. 1, gives elevation of entrance and south front; the plan of the great staircase and of the principal story. BIANCHI and CUCCINIello, *Viaggio pittorico*, fol., Naples, n.d., ii, 47). Vanvitelli died 1 March 1773 at the village of Torre di Caserta, and was buried in the church of S. Francesco di Paola at Caserta. His son-in-law F. Sabbatini; L. B. Dewez; P. Selicantarelli; and

E

G. Pieramini were pupils. SALAZARO, *Poche parole dette sul sepolcro di L. V.*, 8vo., Caserta, 1879. QUATREMÈRE DE QUINCY, *Vies*, 8vo., Paris, 1830, ii. MSS. in the academy of S. Luca; and the museo of S. Martin at Naples. 3, 14, 25, 28, 29.

VANVITELLI (CARLO), professor of architecture, director of the royal works at the Caserta, designed the fontane nel reale Stradone, with some other works, published *Diet. dei disegni del R. Pal. di Caserta*, fol., Napoli, 1756. LUIGI, another son, published *Vita dell' Arch. L. V.*, in *Descr. delle R. dilizie di Caserta*, 8vo., Naples, 1823. GASPARI, another son, was a lawyer. 29, 95.

VAPOUR BATH. A bath of moist heat, as a Turkish bath is of dry heat. TURKISH BATH.

VARA Castellana. A Spanish measure of length.

1 vara = 3 Castilian feet. 1 Cast. foot = 12 inches.
1 " = 33 inches English nearly.
1648 " = 1 mile.
7680 " = 1 league.
1920 " = 1 English mile of 1760 yards.

SWINBURNE, *Spain*, 4to., 1779-87. The Spanish foot = .9267 Engl. feet, by WOOLHOUSE, *Measures*, 8vo., 1836.

VARANGUE. The French term for the top story of a lighthouse; and also for the top story of an Indian gopura.

VARDY (JOHN). A scholar if not a pupil of W. Kent, succeeded H. Joynea between 1748 and 1754 as clerk of works at Kensington palace; and 13 Feb. 1756 held the same post at Chelsea hospital. The following books and prints appear with his name:—KENT, *Designs of I. Jones*, pub. by J. V., fol., 1744. Kent, *Pulpit in York Cathedral*, J. V. del. et sculp. 1749, W. Kent and J. V. del. et sculp., *Interior of Henry VIII's Chapel at Hampton Court, for reception of foreign ambassadors*. 1749, *A Vase in Hampton Court Gardens*, J. V. del. et sculp. Kent, *West front of Horse Guards*, 1752, J. V. del. 1751-53, *East front of same*, J. V. invt.; and plans.

In 1761 he sent to the second exhibition of the Society of Artists of Great Britain (the roll was signed 1766 in which his name appears), Design for a building for the Society of the Dilettanti 1751. Design 1754 for the British Museum, by order of the trustees. Design for a royal palace at Whitehall, fronting the park, just before the new building of the Horse Guards was begun, when clerk of the works to Whitehall, 1748. Design for the north front of S. James's, when the old buildings were taken away next Marlborough house, 1748, when clerk of the works to that palace. In 1762, first design intended for the house of right honble. lord viscount Spencer of Althorp (died 1783); north-west views as executed. This house was designed 1756-63 by Vardy (the north front in S. James's place 1760 by J. Stuart), WOLFE AND GANDON, *Vitr. Britannicus*, fol., London, 1767, i, pl. 40-3. Design 1753 for the court of King's bench, Records, etc., in S. Margaret's lane, when clerk of the works at Westminster. Coloured view of the Gothic hall at Hampton Court, from a drawing made on the spot, and engraved by him when clerk of the works of that palace. In 1763 plan and ceiling of the alcove room on the ground floor as designed and executed by him, at lord Spencer's in S. James's place; front and section. Also chimney for great dining-room, one pair of stairs. In 1764 design for a nobleman's stable and terrace to the garden near Hyde park. Inside view of a bath designed for a gentleman in Suffolk. North-east front and one pair of stairs plan, of colonel Wade's house at Whitehall. Vardy died 17 May 1765 while clerk of the works at Chelsea hospital. A drawing by him is in C. J. Richardson's volume of drawings at South Kensington Museum. TREGELLAS, *The Horse Guards Men., plan and views*, fol. (1880).

On 11 April 1766, another John V. of Chelsea (perhaps a son) married F. Dalby of Hurstchurch, Berkshire (GENTLEMAN'S MAGAZINE, xxxvi, 198); probably this was the architect of Uxbridge house, Old Burlington street, 1790-92, with the assistance of J. Bonomi to the south front; BRITTON AND PUGIN, *Edifices of London*, 8vo., 1825, i, 80. It was erected on the site of Queensberry house, designed 1721-26 by G. Leoni.

VARENNA MARBLE. A village near Menaggio, in north Italy, through the mountain of which the galleries or tunnels of the Stelvio route were cut. Marmo di Varenna is a variegated red, black, and sombre-coloured limestone. BURNHAM, *Stones, etc.*, 8vo., 1883, p. 190. 28.

VARIGNON (PIERRE), the mathematician, born 1654 in Caen, was the son of an architect residing there. 14.

VARIOTARI (DARIO); see VAROTARI (DARIO).

VARKELEY; see ULPIA TRAJANA.

VARNISH. A fluid applied to a prepared surface of paint, paper, wood, etc., by which they are protected from the action of light and of atmospheric changes, and which by its evaporation, or the chemical change of a portion, leaves upon the material a shining coating impervious to air or moisture. The works of the artist and house-painter depend much upon the purity of the varnishes, as much as the quality of the pigments and vehicles. There are three sorts of varnishes: spirit or alcoholic, volatile oil, and fixed oil, formed by dissolving matter in spirits of wine, oil, or other fluid. *Spirit varnish* is easily applied, soon becomes dry, and emits no disagreeable smell; but it is liable to crack or scale off, and does not resist friction or blows. *Volatile oil*, is oil, commonly called spirit of turpentine, used with copal varnish for pictures. Highly rectified oil of turpentine with some caoutchouc is generally used for waterproofing garments. In these the volatile solvents evaporate. In *fixed oil* or fat varnishes, the solvent undergoes a chemical change and dries with the substance dissolved. The most colourless is composed of copal, oil of turpentine, and drying linseed oil; it dries at a common temperature. The *black varnish* of the coach-makers is prepared with amber, drying oil, asphalt, rosin, and some oil of turpentine; this is intended to dry to a very hard consistence. A useful black varnish (Hill & Smith, 1867) for iron, wood, or stone outdoor work, in lieu of tar or pitch, is easily applied and is used cold. The Crown black varnish (Chambers and Co. of Hull) is another, from before 1876.

Mastic is a gum obtained from a species of lentil-tree called *Pistacea lentiscus*, from the isles of the Archipelago, and abounding in Chios. It is transparent and odorous, occurs in the form of drops, liquefies at the heat of boiling water; portions partially soluble in strong alcohol, others in a weak solution, and perfectly soluble in the fixed and volatile oils. It is an invaluable substance to the varnish-maker. *Copal* is the hardest, and most valuable of all the resins. One sort is obtained from the *Rhus copallinum* of Spanish America, the other from the *Elaeocarpus copalifer* of the East Indies; a third sort from the coasts of Guinea (SUMACH). Another fossil copal gum is found in the English colony of New Zealand, sometimes in large pieces; and a fourth from the west coast of Africa, obtained from the beds of rivers. The Manillas copals are exudations concreting on the bark of trees and gathered. Copal is readily dissolved in ether, also in equal quantities of caoutchoucine and alcohol. The best of this varnish is used for pictures; an inferior quality for house work; it takes some hours to dry. Gum *anime*, from having a number of insects in it, exudes from the Courbaril tree, a native of Cayenne and parts of South America; a very hard and true fossil gum is obtained also from the east coast of Africa. It is of a pale yellowish brown colour. It is used for wainscot and mahogany work; the colour is not retained; it soon dries. Amber, sandarac, and lac have oil as a solvent; another description is that in which spirit is used as a solvent. *Sandarac* is transparent, of a yellow colour, occurs in drops, and is the produce of the *Thuya articulata*, of Northern Africa, and around Mount Ararat. While externally resembling *mastic* it differs materially; it dissolves in alcohol but not in oil of turpentine. It is chiefly used in the manufacture of spirit-varnishes. The numerous varnishes for special purposes and their preparation cannot be entered upon herein. BALSAM, BITUMEN, BLACK VARNISH, BRUNSWICK, CERAMICS, DRIER, FRENCH POLISH, GLAZE, GRAINING, GUM, LAC, LACKER, LINSEED OIL, LITHARGE, OIL, PAINT, PAINTER'S WORK,

PATENT DRIER, PETROLEUM, POLISH, RESIN AND ROSIN, SIZE, STAIN, SUMACH, TAR, TURPENTINE, WAX.

One gallon of varnish weighs about eight and a half pounds, and this should bear out well on a flat surface measuring one hundred square yards. Crystal paper varnish will not always do this amount of work. In hot weather, when, of course, varnish is rather thin, it will sometimes cover 120 square yards, but in winter time 90 yards is about the average. All varnishes are more or less influenced by heat and cold, and generally it takes more varnish to cover a given area in winter than it does in summer. Varnish should always be stored in a dry room, with the temperature as even as possible the year round.

Varnish and polish both form a glazing and give a lustre to the surface they cover, as well as heightening the colours of a wooden surface; but they yield to shrinking or swelling and crack off. Waxing resists percussion, but it does not give a lustre to the bodies to which it is applied; it is easily repaired. Varnishes are polished first with finely powdered pumice-stone applied by a piece of serge moistened with water, and rubbed lightly and equally; then with finely-powdered tripoli-earth put upon a clean woollen cloth moistened with olive-oil. Afterwards the work is wiped with soft linen and when quite dry cleaned with starch or Spanish white and rubbed with the palm of the hand, or linen cloth. To re-cover varnish and to clean it, a ley is formed of potash and the ashes of lees of wine. When varnish is said to "bloom", the term has reference to a peculiar dull film which appears in patches on a varnished surface apparently dry and hard. The various causes why varnish does "bloom", are a surface exposed to sulphur-fumes, such as are given out from burning coal; the mixing of one varnish with another; a moisture-charged atmosphere; and water mixed with varnish. The greatest care should be taken in the selection and preparation of all oils used in its manufacture. Painters should never let down their varnish with turpentine unless they have excellent reasons for so doing; turps so used never becomes thoroughly amalgamated with the varnish, and as turpentine has a natural affinity for moisture, it absorbs some quantity of it from the atmosphere, and the chances are "bloom" will appear in patches of various size. Varnish may "bloom" because it is applied over painted surfaces which are neither dry nor hard enough. It is unwise to varnish on a damp muggy day, also in early morning or late afternoon. When a finished surface has "bloomed", the only sure remedy is to rub or cut down the work with ground pumice-stone or fine emery-powder, using a wad of felt as a rubber, then to re-varnish with a proper liquid. Wiping off "bloom", and polishing with flour or French chalk is no remedy, for the defect will reappear within a very short space of time. *Quick spirit varnishes* invariably "bloom" badly; for they are made almost entirely from gum and turpentine. *Paper varnishes* are great culprits in this particular line; *Plumbing and Decorative Chronicle*, New York, 17 Jan. 1885. Another defect in varnishing is called "crawling" from the surface; *BUILDING NEWS Journal*, 1869, xvii, 140.

It is generally asserted that varnish is more liable to injury by dirt than oil paint, and that the means of repairing it cannot be the same, because the dirt adheres more strongly to the resinous parts of the varnish than to the oil surface. Soap and water applied carefully with a sponge, and the use of warm woollen cloths to dry the work, are best in cleaning both surfaces. The steps of wooden stairs which have been painted, grained, and varnished, wear better than those which have been only painted; the gloss is only very slightly injured by the operation of cleaning, and neither dust nor dirt adhere so easily. A coat of varnish can be again put on at any time, but the material becomes darker until it is again considered necessary to repaint. J. SMITH, *Painting in Oil*, 8vo., 1687, describes p. 79, painting with a varnish, rosin, and linseed oil.

Varnished deal and pine without painting. Examples as follows:—The late sir Anthony Carlisle (1857) had the interior

woodwork of his house in Langham place done throughout. The woodwork of the Swiss Cottage at the Coliseum in the Regent's park (pulled down 1876). About 1813 a house at Brighton designed by J. Bonomi for Mr. Prince Hoare. The fine red pine-work at a house in the Isle of Arran for the duke of Hamilton, by J. G. Crace about 1847. CREASE of Bath, *Elegance, etc.*; *Varnishing*, 8vo. (1750), 4th edit., Bath (1802); 1808. PAPWORTH in Royal Inst. of Brit. Architects, *Sessional Papers*, 1857; and *BUILDER Journal*, xv, 654, 668. *BUILDING NEWS Journal*, 1873, xxiv, 606, 633.

TINGRY, *Art de faire et d'appliquer les Vernis, etc.*, 8vo., Geneva, 1803; *Painter and Varnisher's Guide, etc.*, 8vo., 1804; 2nd edit., 1816. *Painter, etc., and Varnisher's Manual*, new edit., 12mo. (1825?). HIGGINS, *House Painter and Decorator's Companion*, 4to., 1841. SOCIETY OF ARTS, *Transactions*, xlv, by FIELD, Lac; and 1833, xlix, 33, etc. *BUILDER Journal*, *Preparation of Varnishes and Varnishing*, 1843, i, 324, 352; xi, 491, *Varnish for iron work*. BARBER, *Painter's Guide*, 1852. *How to Paint a House*. HENNEBUTTE, *L'Art de faire les Vernis*, 8vo., Lille, 1855. VIOLETTE, *Nouv. manipulations chimiques*, 3rd edit., 8vo., Paris, 1860. *Painter, etc., and Varnisher's Companion*, 18th edit., Phil., 1869. THOMPSON, *Oil and Colourman's Guide*, fol. (1860). URE, *Dict. of Arts*, 6th edit., 8vo., 1875-8. *BUILDING NEWS Journal*, a series of articles on the *Theory and Practice of Modern House Decoration*, 1870, xviii, p. 161, 278, etc. JOURNAL MANUEL DES PEINTURES.

VARONIKIN, or Veronikhin; see VORONIKHIN.

VAROTARI (DARIO), called il Cavino, also a painter, born 1539 at Verona, designed the villa Mocenigo at Dolo; the casino on the river Brenta for Fabrizio d'Aquapendente; and the beautiful villa Mantecchia de' Gaodelista at Padua. He died 1596 at Padua aged 56. He had a son ALESSANDRO born 1590, a celebrated painter; and a daughter Chiara, a clever portrait painter, born 1582 at Verona, and died there 1639. 3. 14. 68.

VASANZIO; see SANTEN (JAN VAN).

VASARI (GIORGIO), sometimes called Giorgio Aretino, also a painter, was born 1512 at Arezzo, studied under his father Antonio and G. da Marsiglia; 1524 under M. A. Buonarroti, A. del Sarto, and others. About 1530 he was taken to Rome, thence to Florence and Arezzo, and Rome 1533, where February to June he with his scholar G. B. Cungi studied and measured the antiquities, making upwards of 300 drawings. Only his architectural works are here named in his sojourns at the various places. To Tuscany, thence to towns on the road to Venice, which he left 16 August 1542 for Tuscany, at Rome 1544, and Naples, where he designed the stalls and presses of walnut wood in the sacristy of S. Giovanni a Carbonaro, formerly the Somma chapel; then to Rome, which he left Oct. 1546 for Florence, and in 1547 had almost concluded his "Lives of the Artists"; then to Rimini, Ravenna, Arezzo, where he completed the building of his own house and painted its hall, three chambers, and its façade; 1548 at Mantua, Florence, to Rome 1550 for the coronation of pope Julius III, for whom he designed the Vigna Julia, outside the porta del Popolo, corrected by Michael Angelo, while J. Barozzi completed various apartments from his own designs; the lower fountain is by Vasari executed by Ammannato who designed the loggia above it (in 1768 the villa was almost a ruin). PERCIER AND FONTAINE, *Célèbres Maisons de Rome*, fol., Paris, 1824, pl. 46-9. LETAROUILLY, *Rome Moderne*, 4to. and fol., Paris, 1840, pl. 199, p. 423-5. In 1550 he went twice to Florence, and returning to Rome he in 1553 constructed two very extensive loggias for Bindo Altoviti, decorating them with stucco-work and paintings; one at his *Vigna* with great arches made of woodwork, canes, and matting; the other at his house at Ponte. He left the pope's service for Arezzo, and thence to Florence where the duke's apartments towards the piazza de Grano were commenced under his architect Tasso, a wood-carver; as they were low VASARI designed deep recesses or caissons of wood in the ceilings. At Cortona he arranged the designs and models for the edifice of the Madonna nuova outside the city.

In 1555 he left with his family for Florence, where he entered the service of duke Cosimo; prepared plans and a large model for the rearrangement of the palace, which was carried out by degrees. PIACENZA (in *Decennali* of Baldinucci) speaking of Vasari's architectural works praises the staircases in this palace as being commodious and so easy of ascent. The duke gave Vasari a house in Florence and one in the country. He designed various arches of triumph, also enlarged and reconstructed the machinery for the duke's nuptials, many arches were built; also the loggia, staircases, and apartments, the sala dell' udienza, at the palazzo Vecchio, the foundations being laid in the river Arno; with 1564 the long corridor (nearly half a mile) crossing the river from the ducal palace to the palazzo Pitti, completed in five months; with the fountain in the cortile.

At Pisa 1565 the palazzo degli Anziani (by N. Pisano), now palazzo conventuale, and church de' cavalieri di S. Stefano (interior completed 1594-6, façade later); at Pistoia 1561 completed the tribune or cupola of Sta. Maria dell' Umiltà, designed by V. Vitoni), but it had to be bound by irons; GRANDJEAN ET FAMIN, *Arch. Toscane*, fol., Paris, 1846; 1875, pl. 105; received permission to erect a chapel and decanate in the deanery at Arezzo, which he endowed as a family chapel and is the principal chapel of that church. A model for a third sacristy beside S. Lorenzo for the duke of Florence (erected 1604 from a design by prince don Giovanni, brother of grand duke Ferdinand I). He again visited Rome, and returning 1572 Oct., designed a palazzo for the duke at the Capraia, near Pisa; a small church at Colle Mingoli; with fountains at the Castello. The above account is mainly taken from the life written by himself (with additions) in the celebrated *Vita dei Pittori, Scultori ed Architetti*, 2 vols., 8vo., Flor., 1550; and 4to., 1568: 4th edit. Rome 1759, with portraits and notes by G. Bottari. 10th by Passigli of Florence, 1832-38; edit. by L. and J. Leclanché, 10 vols., 8vo., Paris, 1838-42; in 13 vols., 12mo., Flor., 1846-57; *Leben*, by Schorn, 8vo., Tübingen, 1832-49. Transl. by Foster, 8vo., London, 1840-50, in five volumes. His nephew Giorgio published *Ragionamento su le Invenzioni*, 1588; and also given in 1832-38 edit. of *Lives*.

Among his other works at Arezzo, he restored the ancient abbey church della Pieve (of Sta. Flora); also 1573 the loggia in the piazza maggiore for the fraternità, now used as the public museum, which is considered his masterpiece. At Florence, the decorations to the Isola Bella in the Boboli gardens, including the fountain (*Illustrations*, s.v. *Garden*, pl. 151); GRANDJEAN, ETC., 1875, pl. 8. The door 1553 to the palazzo del comunità (begun by F. della Luna and Brunellesco). The loggie del pesce for Cosmo I, proposed to be destroyed (*Builder Journal*, 1889, lvi, 146 view). Loggia in the piazza di mercato vecchio (FANTOZZI). Church of S. Niccolò in the suburbs. Alterations at east end of Santa Croce. Several altars with the stalls (also ascribed to B. d'Agnolo), and altar of east end in the church of Sta. Maria Novella. 1551-60 the palazzo Uffizi (FAMIN, pl. 77-79) completed by A. Parigi and Buontalenti; and the *zecca* in rear thereof. The drawings in the Wicar collection in the Lille museum are attributed to Vasari and to Buonarroti; DONALDSON, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1853-54; and *Builder Journal*, 1853, xi, 724-6. Among his numerous pupils and scholars are B. Genga, P. de Wit, B. Buontalenti; and he presented Barozzio to pope Julius III.

He died 27 June 1574 aged 63, at Florence, and was buried in the family chapel above mentioned at Arezzo. RUGGERI, *Studio d'Archit. Civile*, fol., Florence, 1755, gives i, pl. 26-35, plan and elevation of the Uffizi; pl. 36, fireplace in magistrato del Processello; pl. 37, door in la mercanzia; and ii, pl. 45, detail in pal. Vecchio. BOTTARI, *Lettere sulla Pittura*, etc., 8vo., Milan, 1822. QUATREMÈRE DE QUINCY, *Vies*, 8vo., Paris, 1830, App. p. 352. GAYE, *Carteggio inedito di Artisti*, 8vo., Flor., 1839, iii.

VASBRUG and Væsbrug. See VANBRUGH (sir JOHN). 25.

VASCO DE LA ZARGA, of Castilla la nueva, 1522 inspected

the works at the new cathedral at Salamanca, directed by J. Gil de Hontanón. 66.

VASCOSI (ANTONIO), of Reggio, also an engineer, about 1653, designed the monastery of the Capuchins di Guastella; and the cappella del SS. Sacramento in the same collegiata. *Vita della fond. suor L. Ferrarini*, Rome, 1709. 93.

VASE. This word in its widest sense comprises all vessels intended to contain fluids, whether they are made of metal, stone, or clay. They may be of any shape. The various names of amphora, jars, pots, and vases are given in RICH, *Illustrated Companion*, 12mo., 1849; 2nd edit., 8vo., 1860; and WESTROPP, *Travellers' Art Companion*, 8vo., 1863. BELL URN. JAR. POTTERY. Greek artists gave to every utensil a shape that appeared best adapted to its destined use, and at the same time agreeable to the eye. They offer models of the most beautiful forms, and of the care with which their execution ought to be accompanied. The vases in terra-cotta, formerly and commonly called "Etruscan", have been chiefly found in Magna Græcia, and other towns, in tombs or sepulchres; the paintings on them have received great attention from their design and execution. *Curves of vases*, in SERLIO, *Architettura*, fol., Ven., 1663, p. 17-20; and of Etruscan vases, in GRUNER, *Ornamental Art*, fol., 1850, pl. 2. 14. 25.

Among the finest specimens of vases are the Portland vase, now in the British Museum; and the so-called Warwick vase, in the grounds of Warwick castle. *Painted Vases* are described by WESTROPP, *Epochs*, etc., 8vo., 1856, as Early or Egyptian; Archaic Greek; Severe or Transitional; the Beautiful or Greek; Florid; Decadence; a list of the names of the various shapes, with outlines, is also given. *Greek Vase Painting*;—RAYET ET COLLIGNON, *Histoire de la Céramique Grecque*, 4to., Paris, 1888. *Archaic*;—DUMONT ET CHAPLAIN, *Les Céramiques de la Grèce propre*, incomplete, 4to., Paris, 1881. W. KLEIN, *Die Griechischen Vasen mit Meisterschaften* (signed, i.e., finest vases), 8vo., Vienna, 1887. KLEIN, *Euphronios*, 8vo., Vienna, 1886. GERHARD, *Ausserlesene Griechische Vasenbilder*, 4to., Berlin, 1839-58: *Coupees et Vases de la Musée de Berlin*; *Coupees Grecques et Etrusques*; *Apulische und Campanische Vasenbilder*, fol., Berlin, 1845; and other publications by him.

CARAVAGGIO, *Ten Antique Vases*, etc., by E. Sadler, 12 pl., fol., Rome, 1605. DEMPSTER, *Etruria Regali*, 3 vols., fol., Flor., 1723. CAYLUS, *Recueil d'Antiquités, Egypt., Etrus., Grec., etc.*, 4to., Paris, 1752-67. D'HANCARVILLE, *Etruscan, Grecian, and Roman Antig. from Hamilton collection*, 4 vols., fol., Naples, 1768. PASSERI, *Picturæ Etruscorum in Vaseulis*, 3 vols., fol., Rome, 1767-70-75. *Serie di trecento tavoli rapp. pitture di Vasi Etruschi*, fol., 1787. TISCHBEIN, (Second) *Collection by Hamilton of Greek Vases from Sicily and Naples*, about 200 pl., fol., Naples, 1791; 1798-1803: *Outlines of the figures, etc.*, therefrom, 62 pl., 8vo., 1814: *Vases therefrom*, by H. Moses, 40 pl., 4to., 1810; 1819. BÖTTIGER, *Griechische Vasengemälde*, 3 vols., 8vo., Weimar, 1797-1800. MILLIN, *Peintures de Vases Antiques*, etc., fol., Paris, 1808. WINCKELMANN, *Monumenti Inediti de l'Antiq.*, 4to., Paris, 1808. BUCK, *Drawings of Greek Vases*, fol., 1811. MOSES, *Greek Vases, tripods, candelabra, etc.*, 170 pl., 4to., 1811; 1817. KIRK, *Outlines—upon Greek, Roman, and Etruscan Vases—Hamilton Collection*, 4to., 1804. MILLINGEN, *Peintures Antiques et inédites de Vases Grecs*, fol., Paris, 1813-17; 1827; translated 4to., London, 1822; and 1853. DUBOIS MAISONNEUVE, *Introduction à l'étude de Vases antiques—des plus belles formes*, fol., Paris, 1817. LABORIE, *Collection des Vases Grecs—comte du Lemberg*, fol., 1803-24. CHRISTIE, *Dissertation on Ancient Greek Vases*, 4to., 1806; 1825. INGHIRAMI, *Monumente Etruschi*, etc., 6 vols., 466 pl., fol., Flor., 1821-6. PANOFKA, *Raccolta di Vasi Scelti*, Rome, 1826; and his *Vasi di Premio*, fol., Flor., 1826. BRONSTEDT, *On Panathenæic Vases*, in *ROYAL SOCIETY OF LITERATURE, Transactions*, ii, 1829-39. FREHNER, *Choix de Vases Grecs inédits*, fol., Paris, 1867; and other books. KRAMER, *Den Styl und die Herkunft der bemalten Griech. Thongefässe*, 8vo., Berlin, 1827. GARGIULO, *Vasi Fittili Italo-greci*, 4to.,

Naples, 1831. CAMPANARI, *Vasi Pittori dipinti—dell' Etruria*, 4to., 1836; and *Antichi Vasi della coll. Feoli*, 8vo., 1837. BEAUVALET dit SAINT-VICTOR, *Vases Grecs et Etrusques*, fol., Paris, 1837 (rare, £70). INGHIRAMI, *Pittura di Vasi fittile*, 4to., 1831-8. LUYNES, *Descr. de Vases peints, Etrus., Sicil., Grec, etc.*, fol., 1845. GERHARD, *Etruscan Vases*, 4to., Berlin, 1839-47, 240 col. pl. POLITI, *Vasi fittile rinvenuti in Girgenti*, 1849. BENNDORF, *Griechische und Sicilische Vasen Bilder*, fol., Berlin, 1877. COLLIGNON, *Cat. des Vases peints du Musée de la Soc. Archéol. d'Athènes*, Paris, 1878. DENNIS, *Etruria*, 8vo., 1878.

ROSSI, *Raccolta di Vasi diversi*, fol., Rome, 1713. AQUILA, *Raccolta da Vasi in Roma*, fol., Rome, 1713. BUONAROTTI, *Frammenti di Vasi Antichi*, 4to., Flor., 1716. BOSSI, *Opera Vase Orat.*, fol., 1772. PIRANESI, *Vasi, Candellabri, etc.*, fol., Rome, 1778. ANTONINI, *Manuale di—Vasi*, 193 pl., fol., Rome, 1821.

THOMS AND PETTIGREW, *Ancient Chinese Vases*, 1743-1496 B.C., 42 cuts, 8vo., London, 1851.

Vase for sound; see ECHEUR.

Used in construction; see POT CONSTRUCTION.

Vases (Fr. *essencecires*) are often used on the balustrade or parapet of a building; *Antique Vases and Mural Decorations, as illustrative of Architecture*, BULLER Journal, 1862, xx, 269, 459, by Hittorff.

Nouveau Livre de Vases, etc., 4to., 1634. CHARMETON, *Designs for Vases*, fol., 1670 (?). MAROT, *Vases and Chimney-pieces*, fol., 1680. SCHYNNVOET, *Garden Ornaments, Lusthof-Cieraden*, 54 pl., fol., Amst., 1704. THOMASSIN, *Statues, Vases, etc., at Versailles*, 4to., 1707; 1724. FISCHER, *Divers Vases antiques—invention de F.*, 13 pl., fol., Leipzig, 1725. GIBBS, *Book of Architecture*, fol., 1728; 1739. SALY, *Vasi inventi et incis.*, fol., 1746. PETITOT, *Suite des Vases de M. Du Tillot*, 30 pl., fol., Paris, 1789 (?). COLUMBANI, *Book of Vases*, 4to., 1766 cir. SALANDRI, *Designs for Vases, etc.*, 4to., 17... LE GEAY, *Vasi invencione*, 4to., 1767: *Vasi, Fontani, etc.*, 1750 (?). RICHARDSON, *New Designs for Vases, etc.*, 4to., 1793. NORMAND, *Collection de Vases, Louis XIV*, 10 pl., 4to., Paris. *Vases, Ornaments, etc.*, 100 pl., fol., Paris, 1802. VARLEY, *Vases*, 43 pl., 4to., 18... BERAINE, *Ornements, galerie d'Apollon, château du Louvre, etc.*, fol., 1710.

VASI (GIUSEPPE), born 1710 at Corleone, in Sicily, was also a painter; studied architecture under F. Juvara, and died 1782 at Rome. *Delle Magnificenze di Roma Antica e Moderna*, by G. BIANCHINI, 10 vols., 4to., 1741-61; 1747-61; 1747-58, reprinted as *Raccolta delle più belle Vedute di Roma*, 2 vols., fol., 1780; 1803: *Raccolta di alcune delle pitt. belle vedute d'Italie*, by Venniti, 4to., Rome, 1761; and *Indice storico del Gran prospetto di Roma*, 8vo., Rome, 1765.

VASI (MARIANO), *Itinerario istruttivo—le antiche e moderne magnificenze di Roma*, 3rd edit., Rome, 1777; 1791; 1820; rivisto dal Nibby, 2 vols., 1821; 1830; 1838; in French, 12mo., 1786; 1819; 1826: in English, *New Picture of Naples, etc.*, 12mo., London, 1820: and *Description de la Bas. de S. Pierre*, 8vo., Rome, 1792. 68.

VASILIKA. The place now occupying the site of SICYON, near Corinth.

VASISTAS, or "was ist das". A hopper pane of glass in a window to admit air; FRANKLIN, *Causes and Cure of Smoky Chimneys*, 8vo., 1787. HOPPER CASEMENT. VIOLET-LE-DUC, *Diet. Rais. d'Arch.*, 8vo., s. v. Fenêtre, p. 416; HUSSON, *Etude sur les Hôpitaux*, 4to., 1862, p. 61 and index. Also the grated opening in a porte cochère; and a little casement in a window to enable a person to look out or to admit air without opening the window.

VASQUEZ (senor R...). Member of the order of the Jesuits, and of the academy of fine arts in Spain, "a most able architect"; was engaged in the important tunnel in the mountains of Guardaran, where he died October 1847. 66.

VASQUEZ (GABRIEL), 1644-6 designed the silleria of the coro of the monastery of the Carmelites Calzados at Madrid. 66.

VASQUEZ (MARTIN), of Evora, succeeded Ougnet, Aquête, Huet, Hugnet, or Hacket, as master of the works at the Batalha.

ARCH. PUB. SOC.

He died before 1448. RACZYNSKI, *Diet. des Arts*, 8vo., Paris, 1847, p. 294; and his *Lettres*, 4to., Paris, 1836, p. 226. PATRIARCHE, *Liste des Artists*. 68.

VASSEUR (BRUNO), of Amiens, by his patriotic exertions in 1813 completed the restoration of the cathedral damaged in 1789 by the revolutionists.

VASSY CEMENT. An argillaceous limestone containing bands of combined silice (the silice being in a soluble form, i.e., not as crystals of sand); found upon the plateau of Burgundy upon the banks of the river Yonne; it is calcined and finely ground and forms a good hydraulic cement. It was manufactured by ... Gariel from before 1832, and used generally in building bridges and numerous similar structures with rubble béton; also in several of the bridges across the river Seine, as explained by RENNIE, *Rubble Béton*, read at INST. OF CIVIL ENGINEERS, *Proceedings*, 1857, xvi, 428. It was also used in the Napoleon bridge, near Pau.

VAST and WAAST (JEAN). See VAAST (J.).

VATERIA robusta or Saul tree (SHOREA). A wood in great repute in the Ganjan and Vizagapatam districts of Southern India, for house and shipbuilding; but as planks it twists and warps whenever the surface is removed. Its strength is 1,121 to 869 for teak (BAKER); unseasoned broke with 1,308 lbs., seasoned 1,319 lbs., and teak with 1,091 lbs. (CAMPBELL): *BUILDING NEWS Journal*, 1856, ii, 919.

VAU or VEAU (LOUIS LE), "voyeur et maistre des œuvres des bastiments du roy," at Fontainebleau; died 14 Feb. 1661, and was buried in the church of S. Louis en l'île at Paris. His wife Etienne Loutet died 24 Nov. 1644: he had two sons, the great LOUIS and FRANÇOIS, and a daughter Anne who married Toison, architecte entrepreneur des bâtimens du roi, and died 13 Sept. 1679 aged about 60, in la rue de l'Université.

So little is recorded in the usual books as to this family, that the accounts following are given in fuller detail than usual; also to assist in explaining discrepancies.

VAU (LOUIS LE), born 1612 or 1613. Nothing is found recorded of his early life, nor the dates of many of his works. The earliest is 1630, the hôtel Bullion for Claude de Bullion, surintendant of finance, in great magnificence, destroyed 1777, and the painter Failler purchased the site in 1780, erecting three houses on one of which is still inscribed the name: other portions were destroyed 1882 for the new hôtel. 1653 château de Vaux le Comte (and Vicomte) for N. Fouquet, surintendant of finance; known later as Vaux de Villars, and de Praslin (BRICE, iv, 389; SAUVAL, iii, 440; *Cours*, iv, pl. 68; MAROT, pl. 106-8; CLARAC, 363; 12 plates in the King's collection of prints, Brit. Mus.: also NORMAND, *Le Château de Vaux le Praslin*, 8vo., Paris, 1887). Château de Bercy, near Paris, for M. de Malon; rebuilt for marquis de Nointel, restored 1700-13; sold Aug. 1860 to be pulled down by the Nicolai family (BRICE, ii, 260; four plates of the saloon in ROUYER, i, 105). Château de Livry, later le Raincy, near Paris, for M. Bordier, intendant of finance, destroyed early in the revolution (Petit MAROT, pl. 7-19; CLARAC, 363; BLONDEL, *Discours*, 1754, p. 64). Château du S. Sépulcre for M. de Hesselin, near Troyes, in Champagne (MAROT, pl. 109-12). Hôtel du président Lambert de Thorigny, isle S. Louis (BRICE, ii, 337-42; CLARAC, i, 363; SAUVAL, ii, 224; MAROT, pl. 37). Hôtel or maison du Enselin or d'Hesselin or Hensselin, isle S. Louis (BRICE, ii, 347; SAUVAL, iii, 14; MAROT, pl. 52-8 adding "l'aisné"). Hôtel de Ant. Tambonneau, rue de l'Université or du Colombier, later comte de Marsan, comte de Matignon, and 1724 prince de Pons (*Arch. Franç.*, i, 256, pl. 85; BRICE, iv, 58; MAROT, pl. 46). Hôtel de Colbert, rue Neuve des petits champs (by P. le Muet), later used as stables by the duc d'Orléans (*Arch. Franç.*, iii, 42; the good gateway in *Délices de Paris*, fol., 1753, pl. 116; MAROT, pl. 26-8; SAUVAL, ii, 202-4). Hôtel de Hugues de Lionne Vaule Vicomte, rue Neuve des petits champs, later known as d'Estrées; 1703 of Louis Phélypeaux de Pontchartram, of M. de Calonne, and then occupied by the contrôleur général (BRICE, i, 414; F.

MAROT, pl. 40). 1655 the church of S. Sulpice, in place of the church 1646-53 by C. Gamard; the chapelle de la Vierge was carried up as high as the cornice; completed by D. Gittard after 1670; works suspended 1675-1719 and recommenced 1733 by Servandoni, Oppenort, Lambert, and others. He also followed Gamard or Gonnard at the restoration of the church of S. Germain des Prés. Hôtel des Hameaux (SAUVAL, iii, 5, "Vau's manner"): Hôtel de Rohan, rue de l'Université: Maison de Bautru, called "la Gentille" (SAUVAL, iii, 13); are also mentioned as by le Vau.

From 1653 he directed the works at the Louvre succeeding Mercier; he formed the "enceinte de la cour", adding a grand entrance, the east side, and return sides as far as the north and south entrances (*guichets*); the outside was masked 1667-70 to the east by the colonnade (*Arch. Franç.*, iv, 57, 59, pl. 13, 14), and to the south by the façade, by Perrault (*Arch. Franç.* and MAROT, pl. 2). 1664 made a design for Colbert for a grand façade to the Louvre, *Arch. Franç.*, iv, 71; and is said to have added a gallery 1,362 ft. long by 30 ft. wide, carried out by Dorbay. The grand colonnade, façade or peristyle is said by some writers to have been carried out 1667-70 by le Vau, and continued 1670-1725 by Dorbay (BRICE, i, 44; SAUVAL, ii, 62) upon Perrault's design, as s. v. PERRAULT; (PATTE, *Mémoires*, 4to., Paris, 1769, p. 319). At the Tuileries he 1664 effected great restorations, as the centre pavilion facing the gardens by de l'Orme and J. Bullant (BRICE, i, 131; *Cours*, iii, 73); to which he added columns of the composite order, and an attic surmounted by a quadrangular dome (*Arch. Franç.*, iv, 71, pl. 25), and the upper part of the end pavillons de Flore and de Marsan (BERTY, p. 160), with pilasters of the Composite order and an attic (four plates were engraved by Olry de Loriande). MILIZIA praises this architect's design for the Composite order in the Tuileries, which looks well in curvilinear figures, and in the interior of rectangular ones (edit. 1826, p. 117), and yet (p. 193) he appears not to approve of it. DONALDSON, at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1853-4, p. 79).

At the château de Vincennes, 1660 he added the two wings and the gateway facing the park, for cardinal Mazarin, keeping the donjon and eight towers (*Arch. Franç.*, iii, 6; BRICE, ii, 253; BLONDEL, *Discours*, 4to., 1754, p. 64; *Cabinet du roi* at R. I. B. A., vol. xiii; and the King's collection of prints, in Brit. Museum. 1660-62 the church and collège de Mazarin or des Quatre Nations; Auberry worked under him, not Dorbay as usually stated (MAROT, pl. 78; JAL; VIOLLET-LE-DUC, *Dict. Rais.*, s. v. Tour, p. 158). The parish church of the prémontrés de la Croix rouge (LAMBERT, iii, 138). 1664 the small parish church of S. Louis en l'île Notre Dame, continued by G. le Duc, and by Servandoni (BRICE, ii, 350; LEGRAND et LANDON, i, 157; MAROT, pl. 82); finished 1726 by J. Doucet. 1665 at the château de Versailles, two pavillons and orangery (LANCE), or three chief corps de logis (*Arch. Franç.*, iv, 93; LABORDE, *Versailles*, p. 91, 94; plates in Brit. Mus., King's collection).

His titles 1670 were conseiller du roi en ses conseils, intendant et ordonnateur général des bastiments de sa majesté, premier architecte de ses bastiments, secrétaire de S. M. maison et couronne de France, etc.: BLONDEL, *Cours*, vi, 514, describes his style as "lourd, pesant et froid", as compared with that of Perrault's; also by PATTE, *Mémoires*, 4to., Paris, 1769, p. 331. J. Richer, P. de Lambert, and F. Dorbay (said to have been a nephew (*Cours*, iii, 65), were among his pupils. He was buried 11 October 1670 in the church of S. Germain l'Auxerrois, having died in his house, previously the hôtel de Longueville, rue des Poulies or des Fossés, at end of rue S. Honoré, which he had greatly altered and lived in during many years (BRICE, i, 127). He left a son Nicolas, baptised 11 May 1643, and three daughters (JAL, p. 1224) by his wife Jeanne Laisné.

VAU LE JEUNE. According to JAL, he was "frère cadet de L. le Vau". He was employed by Colbert; as 2 August 1662 repairing the ponts de l'île Adam; works at Versailles and S. Germain; at the château de Seignelay, Colbert's summer resi-

dence; 1664 at Nevers; S. Germain; a design for the façade of the Louvre; works at the ponts de l'île Adam; 13 Nov., Orleans, and also 14 June 1666; Fontainebleau 9 Sept. 1666; Chambord 28 Oct.; Tours 10 May 1667; Paris 7 Dec. 1667 as to the foundations of the grande face and two pavillons of the Tuileries; 29 April 1669 Orleans, etc., Beaugency, Nevers, Fontainebleau; and 1671 Rochefort (*Letters to Colbert*, signed by "Vau le jeune"; JAL). The maison de l'abbé de la Rivière, bishop of Langres, at Paris (is by "jeune le Vau" and Dorigny, SAUVAL, iii, 21). It is this le Vau, probably, who before 1669, under the superintendence of Duval and Le Muet, directed the erection of the north and south fronts of the Salpêtrière, and 1670 did the chapel; as also the chapelle de Bicêtre (HUSSON, *Etude sur les hôpitaux*, 4to., Paris, 1862); Bruand is added to le Vau, at the first named, by Q. DE QUINCY, *Vies*, ii, 360; also LEGRAND, i, 211; and BLONDEL, *Cours*, ii, 13, 203; iii, 49; vi, 474. A plate of the portail du Louvre, "by le Vau le jeune" engraved by Durant, is in the cabinet d'estampes du roi (VIRLOYS).

1st December 1671 a "Le Vau" was nominated one of the original members of the academy of architecture at Paris. It is probably his pretentious signature that is appended to a report dated 1678, given in DALY, *Revue Générale*, 1852, x, 200; and another of 1671 by JAL, p. 786. In 1688 he was at Anet for duke Louis Joseph de Vendôme when receiving the dauphin (ROUYER ET DARCEL, *L'Art Architectural en France*, 4to., Paris, 1863-66, i, 32). The deaths of these two le Vau's are not found. MAROT "grand", *Recueil des Plans*, etc., fol., Paris, 1670; 1727. LAMBERT, *Histoire Litt.*, 4to., Paris, 1751, iii, p. 137. BRICE, *Nouvelle Descr. de Paris*, 8vo., Paris, 1725. BLONDEL, *Architecture Française*, fol., Paris, 1752-56, ii, 2; iv, 5-7, 34. BLONDEL, *Cours*, 8vo., Paris, 1771, refers to details of Vau's works, in i, 102, 330; ii, 13, 175, 186, 218, 228; iii, 32, 62, 73, 74, 186, 235, 302, 324, 330, 361, 440-2; iv, 297; vi, 513. QUATREMÈRE DE QUINCY, *Vies*, 8vo., Paris, 1830, ii, 361. VITET, *Le nouveau Louvre*, in "Revue des Deux Mondes, July 1886. JAL, *Dict. Critique de Biog.*, 8vo., Paris, 1867, p. 785 and 1224. LANCE, *Dict. Biog.*, 8vo., Paris, 1872. 3. 5. 25. 29. 34. 112. 113.

VAU (FRANÇOIS LE), brother (called frère cadet by LANCE) of the great Louis. 1658 conseiller et architecte ordinaire des bastiments du roi, son of the Louis le Vau, voyer, etc., had a son François, baptised 1660, died 30 Sept. 1666, and a daughter Jeanne Elizabeth, baptised 29 January 1662, by his wife Elizabeth Crestey, Cretey, or Crété. He died 4 July 1676 at his house in the île Notre Dame, quai d'Orléans, and was buried in the church of S. Louis there; (JAL). His signature is almost exactly the same as that of his brother Louis when that was simple.

VAUDOYER (ANTOINE LAURENT THOMAS), born 20 October 1756, at Paris, son of a négociant, became a pupil of M. J. or A. F. Peyre. In 1783 he obtained the grand prix, studied at Rome, and designed a restoration of the theatre of Marcellus (published 1786 in the *Grand prix*, 8 plates); and returned in 1788. About 1800 he was successively architect to the observatoire; the collège de France; and of the Sorbonne; designing large additions; and 1806 the salles des séances at the collège Mazarin or des Quatre Nations (by L. le Vau) for the palais de l'institut royal (as published 1837, in GOURLIER, etc., *Choix d'édifices*, fol., Paris, 1845-50, iii, pl. 222; also LEGRAND ET LANDON, *Descr. de Paris*, 8vo., 1808, ii, 94); also to the monastery des Petits Augustins, now the musée des monuments français; and 1812-20 directed the erection of the marché des Carnes, place Maubert (NORMAND, *Paris Moderne*, 4to., Paris, 1846, pl. 25-7; GOURLIER, etc., i, pl. 147-8). He competed 1807 for the temple de la Gloire (la Madeleine), which design he published; reconstituted the école d'architecture with D. le Roy, also the école des beaux arts. Vaudoyer published, *Idées—sur le lieu destiné à la sépulture des hommes illustres, de France*, 12mo., 1791. *Restauration des piliers du Panthéon français*, 4to., Paris, 1798. *Description du théâtre de Marcellus à Rome*, 4to., Paris, 1812. *Grands prix d'architecture*, fol.,

Paris, 1791-1805, in 120 pl., assisted by van Cleemputte, Detournelle, Allais, et Baltard. The *Discours* at the funerals of Poyet, 1824; de Thibault, 1826; J. Rondelet, 1829; and Guénepin, Delespine, Percier, Huyot, Huvé, Dumont, for Acad. royale des Beaux Arts. *Notice sur l'ancien château de Madrid*, 4to., Paris, 1839. *Rapport sur la Colonne Alcauldine à St. Pétersbourg*, fol., 1840. *Mémoire sur la restauration de la colonne Trajane par C. Percier en 1788*, fol., 1840. He was appointed 1804 architecte et conseil des bâtiments civils; 1816 chevalier de la légion d'honneur; 1823 a member of the académie des beaux arts. Among his pupils were J. M. del Gabio, A. F. J. Girard, his nephew L. H. Lebas, A. M. Renié, and H. Labrousse. He died 27 May 1846, aged 90. 113.

VAUDOYER (LEON), born 1803, son of the above, received 1826 the grand prix, and designed the monument to general Foy, in Père la Chaise; GOURLIER, ETC., *Choix d'édifices*, fol., Paris, 1825-36, i, pl. 198, carried out by his father. About 1830 he designed the small monument to N. Poussin in the church of S. Lorenzo in Lucina; 1839 gateway to the Conservatoire des Arts et Métiers (MONITEUR DES ARCHITECTES, 4to., Paris, 1852, xiv, pl. 157-61); 1839 the monuments to admiral Truguet (DALY, *Arch. Funéraire*, ii, pl. 4, and to Nourrit, *idem*, pl. 3); and 1847 to the Vaudoyer family (*idem*). He restored at ORLEANS, most of the domestic buildings in that city as well as the façade of the *salle S. Lazare* at the *hôtel dieu*, and the *hôtel de ville*; these are comprised in one volume in the COMMISSION DES MONUMENTS HISTORIQUES DE FRANCE, *Archives*, fol. He designed in conjunction with H. Espérandieu, the new cathedral of Notre Dame de la Major at MARSEILLES, the first stone of which was laid 26 Sept. 1852, and at his death 1872 it was still far from completion. He published *Instructions sur les moyens de prévenir ou de faire cesser l'humidité dans les bâtiments*, 4to., Paris, 1844; and DALY, *Revue Générale*, 1844, v, 266, etc. *Patria: La France, ancienne et moderne; Architecture*, 12mo., Paris, 1846. *Notice sur Le Bas*, 4to., Paris, 1869. In 1868 he was elected a member of Institut des Beaux-Arts. He died suddenly March 1872 whilst acting on a committee. DONALDSON, *Biog. Notice* in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1874. RÉVOIL, *Eloge*, 1877. *Exposition des dessins de L. V.*, in DALY, *Revue Générale*, 1873, xxx, 37-45, noticing a memoir by Eugé and Davioud, two of his pupils.

VAUGIRARD QUARRY; belonged in 1678 to M. Samson; it was one of the quarries from which stone was obtained for building in the île de France at that date; a section is given in DALY, *Revue Générale*, 1852, x, pl. 13 and 15. It is one of the tertiary beds of the Paris basin, of which the "calcaire grossier" gives one of the most important building stones on account of its compactness and light cheerful colour. The same stone is quarried at Mount Meudon; BURNHAM, *Limestones and Marbles*, 8vo., Boston, 1883, p. 149. HENICART DE THURY, *Descr. des Catacombes de Paris*, 8vo., Paris, 1815.

VAULSURA. A Latin term for a VAULT.

VAULT. An arch of which the depth exceeds the span (Fr. *berceau*; 25). A prolonged arch, as a covering of space. A construction in masonry or brickwork curved in vertical section, in which the several parts mutually sustain each other by the force of gravity tending towards the centre or centres of the curve or curves. The gallery at Tyrins has the doorheads formed of stones placed obliquely. At Nimroud, a vaulted drain about 5 ft. wide, was found at the south-east corner of the mound; another, the arch being of kiln-burnt bricks; another beneath the north-west palace; and a third beneath the south-east edifice; LAYARD, *Nineveh and Babylon*, 8vo., 1853, p. 162-5. FERGUSSON, p. 259. The tomb called Deposito del Gran Duca or del Sovrano, at Chiusi, discovered 1818, is vaulted over with a perfect arch of neat travertine masonry; more than 2,000 years old; DENNIS *Elurria*, 8vo., 1883, ii, 338, who names others. Temple to Apollo, by Ictinus, near mount Cotyleum. PAUSANIAS, viii, 41.

Vaulting was carried to great perfection by the Romans and applied largely and successfully in the erection of their enormous structures, such as the thermæ, at Rome, Naples, and elsewhere: WILLIS, *Arch. of the Middle Ages*, 8vo., 1835, p. 67.

| Buildings, vaulted. | | Width in feet. |
|--|------------------------|-------------------------------|
| Liverpool. S. George's hall | 65 | 74 between walls × 83 columns |
| Hall of Caracalla's baths | 63 | |
| London. Law courts, great hall | 48 × 80 | high |
| Rome. Thermæ of Agrippa | 60 × 91 | " |
| " " Nero | 67 × 91 | " |
| " " Vespasian, Domitian, or Trajan | 49 × 77 | " |
| " " Titus | 70 × 92 | " |
| " " Caracalla | 78 × 93 or 108 | " |
| " " Diocletian | 79 between walls × 110 | " |
| " latest of Roman works | 64 | cols. |
| " " Constantine | 57 × 75 | " |
| " Basilica of Maxentius or Constantine | 83 × 120 | " |

Other references will be found *see* HALL.

It appears that the builders of the west of Europe, in the north of France and in England, did not venture to build a vault over a space of 20 ft. before the middle of XII cent., nor are any vaults known of such dimensions in Italy during X or XI century. The lower floors of Norman castles were vaulted, but stone vaulting, except in the aisles, was not common in England during the early part of Henry I's reign; PETIT, *Boxgrove Priory*, 1861, p. 7. None in England except the chapel of S. John in the Tower; GOULD, *Freemasonry*, 4to., 1883, ii, 262, 277. None before 1150; ASSOCIATED SOCIETIES, *Reports and Papers*, 1881, lxxii. At Lincoln, bishop Alexander repaired the church after a fire about 1141, made it more beautiful than on its first erection, and was the first to give it a vaulted roof, as related by Giraldus Cambrensis and John de Schalby. The vaulting of the body of a large church was a thing perhaps not attempted in England before 1146. Norman vaulting at Caen, etc., by PARKER, in R.I.B.A., 1863, p. 121-6. Also at Copford church, Essex. Peterborough cathedral shows the usual vaulting in the latter part of this style, with arch ribs and groin ribs; in one bay is a boss at the crossing or intersection of the ribs, in the other there is none. The church of Notre Dame, Mantes, commenced in 1280, from the designs of Eudes de Montreuil; the vaulting of the roof of this church is pitched with an extraordinary boldness; it is related that when the building was finished, the workmen refused to remove the centering, till Eudes, by sending his nephew to assist them, quieted their apprehensions; the height of the roof from the pavement is 96 feet; MILLIN, *Ant. Nat.*, ii, No. 19. *Early English vaulting*; example at Lincoln cathedral, boss and ribs of vault, north side of nave. *Decorated vaulting*; cloisters at Norwich. Stone roof of the original vestry on north side of chancel at Willingham church, Cambridgeshire. *Perpendicular vaulting* (FAN VAULT). Christ Church Hall, Oxford, in bay window: and at the cathedral. Divinity School, Oxford. A list of fan vaults in England is given by WILLIS, *Vaults of the Middle Ages*, 1842, p. 55. Of German churches, WHEWELL, *Arch. Notes*, 8vo., 1837; 1842, p. 98-101.

Wood vault. Hall at Rouen. Hall at Dijon, *cir.* 1549. Lincoln cloisters. Milan cathedral. Lichfield, imitation by J. Wyatt. York minster, nave. Selby Abbey church, stone prepared for; ASSOCIATED SOCIETIES, *Reports and Papers*, 1875, p. 149. Warmington church, Northamptonshire (early English), a fine example. 1.

Vaulting as a protection from fire. This was urged 1862 in BUILDER *Journal*, xx, 338, 415. The Kaisersaal at Aachen was saved in the fire of 1883, *idem*, xlv, 42; S. Stephen's cloister and crypt, Westminster palace, in the fire of 1837. FIREPROOF CONSTRUCTION.

It is manifest that from the practice of vaulting the naves of cathedrals, the invention of the buttress must have arisen; for common sense could not long endure such a wasteful mode of building as that of using a wall where a buttress would perform

the same duty; WARE, *Tracts on Vaults*, 8vo., 1822, p. 72. DE LASSAULX, in WHEWELL, *Architectural Notes*, 8vo., Camb., 1842, p. 180, writes of the former church of the Jesuits at Coblenz that it "was built from 1609 to 1615; it is a most remarkable example of the construction of vaults, on a plan as scientific as it is bold; and in no other church known to the author are the walls so thin, and, with the exception of the choir, buttresses entirely dispensed with." The vaults are only 5 ins. thick, and are not cross vaults but a cylindrical vault with intersecting lunettes.

WILLIS, in *Vaults of the Middle Ages*, 1842, gives an illustration showing on the bed of a stone the method adopted, of setting out the mouldings in vaulting, a rare example. RORICZER, *Detached Essays*, explains the method of making the template or mould for working the mouldings of a canopy. CRESY, *Stone Church, Kent*, 1840, refers to the subject, and in his *Encyc. of Civil Engineering*, 8vo., 1861, enters much into the subject, reproduced in GWILT, *Encyc. of Architecture*, 8vo., 1888. Another occurs in the "Crowle Pennant", xi, 212, in the British museum, for a cross, dated 1442, and found April 1739 at the Mansion house, being part of the remains of S. Mary Woolchurch, burnt 1666. An example showing the lines on the top bed for forming a capital, from S. Alban's, Hertfordshire, is given in *ARCHITECT Journal*, 1850, ii, 222. "Amongst a heap of worked stones gathered from the ruins at Wenlock priory, Shropshire, E. Roberts discovered one having on the upper surface some very beautifully incised lines of Early English mouldings, which illustrate the subject of ancient architectural drawing; the lines show that they were cut as moulds, and not for the purpose of the stone itself; indeed they extend beyond the points where they could have been available, and there are other mouldings neither connected nor applicable."

ANGLE RIB. ANNULAR VAULT. ARCH. BARREL ROOF. COMPOUND VAULT. CRADLE VAULT. CROSS RIB. CROSS VAULT. CYLINDRICAL VAULT. DOME. DOS D'ÂNE. DOUBLE VAULT. FAN VAULT. FORMERET. FORNIX. GROIN ARCH. GROINED VAULT. HEXPARTITE. HOLE in vault. LIERNE RIB. NERVURES. OCTOPARTITE VAULT. QUADRIPARTITE. REAR ARCH OF VAULT. RIB. RIB VAULT. RIDGE RIB. ROMAN VAULT. SEXPARTITE VAULT. SPHERICAL VAULT. STELLAR VAULT. STONE ROOF. SCOINSON. TAS DE CHARGE. TIERCERON. TRANSVERSE RIB. UNDERPITCH or Welch VAULT. WAGGON VAULT. 1. 16. 17. 19. 25.

WARE, *Tract on Vaults and Bridges*, 8vo., 1822. WHEWELL, *Arch. Notes on German Churches*, 8vo., 1842, p. 76; 159; 180. WILLIS, *Vaults of the Middle Ages*, in ROY. INST. OF BRIT. ARCH., 4to., 1842; transl. in DALY, *Revue Générale*, 4to., Paris, iv, p. 3, 289, 481, 529; continued by WEST, *idem* Institute, 1874-75: EAGLES, *idem*, 1873-74; and CARPENTER, 1876-77. GARRETT, *Principles of Design in Architecture*, 12mo., 1850, p. 164-79. ECCLESIOLOGIST *Journal*, 1848, ix, 106. VIOLLET-LE-DUC, *Dict. Rais. d'Arch.*, 8vo., 1854-68, s. v. Construction also s. v. Eglise. OKELY, *Development of Christian Architecture in Italy*, 8vo., 1860, p. 205-8. STREET, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1865, p. 97. TARN, *Gothic Vaulting*, *idem*, 1866, p. 545. SCOTT, *Lectures*, 8vo., 1879, ii; 88-9; 153. WOOD, *On Vaulting*, in *BUILDER Journal*, 1883, xlv, 51.

VAULT. An enclosure formed in the ground wherein a corpse is buried. BUILDING NEWS *Journal*, 1869, xvi, 20. CRYPT. "Vaults are yet builded under great churches to put us in remembrance of the old state of the primitive church before Constantine." *Homily, Peril of Idolatry*, p. iii. It is a late use of this term because the grave became arched over.

Also formed underground for the storage of materials; as COAL CELLAR, BEER CELLAR, WINE CELLAR. They were formerly always arched, but of late years have in some cases flat concrete coverings. "Construction of Vaults beneath public ways," by W. Haywood, C.E., in the city of London; *BUILDER Journal*, 1856, xiv, 50. No vault, arch, or cellar to be made under any street without the consent of the vestry or district board—and to be kept in proper order by the owners;—Metropolis Management Act 1855, sec. 101, 102.

VAULTING CELL. The space between the ribs of a vault; WHEWELL, *Arch. Notes*, 8vo., Cambridge, 1842, p. 76, 112. ESCUCHEON.

VAULTING COURSES (Fr. *tas de charge*). At Cologne, the lower part of the vault is formed by horizontal courses of the stonework, projecting out from the wall; consequently the actual span of the vault and its volume or bulk are proportionably decreased, while the abutment is in the same degree strengthened; as noticed in MOLLER, *Memorials*, 8vo., 1836, p. 154. The system was perhaps universal. 1.

VAULTING RIB. The projecting moulding of arched work, to decorate the surface of a vault. The ridge or summit rib, Fr. *lierne*; the rib passing across the span, Fr. *neuvre*; the sub-arch, Fr. *arc doubleau* and *formeret*; the angle one, Fr. *ogive* or *croisée d'ogive* and *diagonal*; the inner ribs at right angles, Fr. *tierceron* or *tierceret*; the wall rib, Fr. *formeret*. In vaults of the Roman and Italian styles, of which the groins are without ribs, the vaulting surface is the leading feature, and the disposition of it the only object to be attended to. But in Gothic vaults, on the contrary, ribs are the principal features, and the surface of the vaults subordinate. To maintain this subordination of the vaulting surface to the ribs, the latter should branch off from the abacus with the greatest possible appearance of mutual independence as separate arches, an appearance which is better given by single-arc ribs than by double-arc ribs, or semi-fourcentred arches. Also, the vaulting surfaces or panels of contiguous compartments should by no means have the appearance of continuity, which is given by the projection system, but which immediately suggests the idea that the surfaces really constitute the mechanical vault independently of the ribs, which seem to have been subsequently added, and might be removed without destroying the vault, instead of which the ribs really support the vault and should appear to do so in the decorative as well as in the mechanical construction. The apparent mutual independence of the ribs is increased in the best specimens by the manner in which they start from the abacus, some being more prominent than the others; WILLIS, *Arch. of the Middle Ages*, 8vo., 1835, p. 83. DALY, *Revue Générale*, 4to., Paris, 1857, xv, pl. 15. VIOLLET-LE-DUC, *Dict. Rais.*, 8vo., 1857-1868, s. v. Construction, and *Voute*. Sections are given in SHARP, *Chichester, New Shoreham, etc.*, 4to., 1861, p. 10, 16. PALEY, *Manual of Gothic Mouldings*, 8vo., 3rd edit., 1865.

VAULTING SHAFT. A small SHAFT, column, or pillar which supports the ribs of a vault. When rising from a corbel, Fr. *perche*. WILLIS, *Remarks*, 1835, classifies them as bearing, sub, face, edge, and nook (p. 34); also diagonal and transverse, according to the ribs they carry. In a large class of churches the vaulting shafts are found stopped before they reach the ground, and on which the piers are simple cylinders or octagons, upon whose abacuses the pier arches rest. These pier arches may be compound arches, and indeed generally are of two orders; the bases of the vaulting shafts either rest on the ledge of the abacus, or upon corbels or strings above. Another class nearly allied to this is one in which the pier is compound, but all its parts relate to the pier arches alone. There is a marked difference between the vaulting systems of one country and another, which makes it essentially necessary to enter minutely into the analysis of their parts. Thus the vaulting shafts in England are so rarely allowed to descend to the ground, that the cases where it does occur may be called exceptions only; whereas on the Continent they generally do so descend. Norman churches of England have, for the most part, plain cylindrical piers, but when they have compound piers, their parts rarely exhibit connection with the vaulting shafts, but with the pier arches. Early English churches, in like manner, have rich pier arches, generally consisting of three orders, with sub, edge, and face shafts, as at Ely, or, if of more, their shafts and arches arrange themselves into three groups of the same kind, as at Exeter; and the vaulting shafts (generally three)

either rest on rich corbels in the spandrels of the pier arches, as at Lincoln, or are stopped higher up; whereas in the contemporaneous churches of the Continent the vaulting shafts either descend to the ground, or have bases which rest on the abacus of the pier. Of the superior effect of the English arrangement over the last-mentioned one there can be no doubt. A corbel may always be proportioned to the weight or projection of that which it supports, and, on the other hand, the weight sustained by a shaft should always appear to rest on its axis. Hence, when a single large pier or shaft is employed to sustain pier arches, a disagreeable effect of intrusion is produced by the appearance of a group of small bases, shelved, as it were, upon the edge of the abacus; and even when this is softened by the employment of an applied half column to carry them, there still remains the barbarism of one shaft sustaining three or more smaller ones. The Norman south transept of Peterborough; Trinity chapel, Canterbury; and Malmesbury abbey church, also the Early English "Temple" church, London, are examples of this awkward practice, fortunately rare.

VAUSING. "To make the jaumes (of a window) to oversale the mullions, and that is wrought into several kind of mouldings, and adorned with other works as the master pleaseth to put on"; Randle HOLMES. **VAWCER.** 16.

VAUX. A French system of FIREPROOF floor.

VAWCER, vincer, vovser, wawcer; see **VAUSING**. A worked arch stone; now written **VOUSSOIR**; WILLIS and CLARK, *Arch. History of Cambridge*, 4to., 1886; *Glossary*, iii.

VAWS CORNICE. The term given to the top mouldings of the architrave of a wood chimney-piece as shown in **MOXON**, *Mechanical Exercises*, Joinery, 4to., 1678, p. 113, and pl. 6.

VEAU (LOUIS LE); see **VAU** (L. LE).

VECCHI (GASPARD), son of Giovanni de Vecchi, painter, of Rome (died 1614 aged 70). At Rome he designed the collegio de' Neofiti with the adjoining edifice to the chiesa di Madonna de' Monti Santi (by G. della Porta); **LETAROCILLI**, *Rome Moderna*, 4to. and fol., Paris, 1840-50, p. 168, pl. 27. 5.

VEDICA. A Hindoo term for a raised seat or pedestal placed on each side on the outside of the door of a house, **RAM RAZ**, *Arch. of the Hindus*, 4to., London, 1834.

VEDINUM. An ancient name of **UDINE**, in Northern Italy.

VEDROS. A Russian measure, 7 = 18½ gallons English.

VEDYADHAR. A Jain architect, a native of Bengal, to whom is attributed the laying out of the town of Jeypore 1728, on a regular plan with streets at right angles. A. P. S.

VEGA (LUIS DE), 1537 Dec. 21, was with A. de Covarrubias appointed royal architect by Carlos V and Felipe II to rebuild and enlarge the royal palaces. The courtyard of the alcazar at Toledo was completed by him in 1555; 1556-9 he added various works to that at Madrid; 1552-58 to the royal *sitio*, el Pardo near the city (begun 1540 for Charles V); and 1552 to la real casa del Campo. At Madrid he also designed the old parish church of S. Gil, destroyed 1615 except the columns and doorway, by J. Gomez de Mora for a new church (destroyed by the French). He added to the alcazar at Aranjuez; and at Valsain from Gaspar de Vega's design; 1545 at Seville, he was appointed with G. de Vega and others (MORALES) to choose a site for the hospital of La Sangre. He died 10 November 1562. **LLAGUNO** gives large extracts from the archives relative to the above works, ii, 153-168. 3. 66.

VEGA (GASPAR DE), nephew and pupil of **LUIS**, and brother-in-law of F. de Villalpando. With his uncle he continued the palace at Madrid begun by Carlos V (burnt 1734), and designed 1556-64 the royal armoury 227 ft. by 36 ft. on the south side, which was the *caballeriza* of Felipe II. At Seville, in 1545 he was appointed with his uncle as above stated, and 1550 restored the alcazar; 1552 designed the rebuilding and enlargement of the royal palace del Valsain bosque de Segovia carried out by his uncle; **LLAGUNO**, ii, 42-51 and 196-214 gives a long account from the archives of these works. At Madrid, 1556-9 including 1561 at the Pardo; in Azecca 1557; in Aranjuez 1559; at

ARCH. PUB. SOC.

Toledo 1559 part of the church of the Minims with F. de Villalpando. At Uclès in New Castile, he designed the works for the order of Santiago, which after his death in 1576 were followed by other architects. At Segovia 1565 as maestro mayor he made considerable repairs to the alcazar; and also to the casa real de la Fuenfria. 66.

VEGA. See **MARTINEZ DE LA VEGA**.

VEGA (PADRE MELCHOR DE), 1638 maestro mayor of the royal works at Valladolid, Simancas, castillo de Burgos, and the royal cuarto del Abrojo. His son **MELCHOR**, 1640 was *aparejador* at the same works and succeeded to his father. 66.

VEGETABLE MARKET. **WEALE**, *Handbook to London*, 8vo., 1851. *Covent Garden* in **LOUDON**, *Arch. Magazine*, 8vo., 1838, v, 665. **BALTARD**, *Halles Centrales à Paris*, fol., Paris, 1863. **MARKET**.

VEGETIUS (FLAVIUS REGNATUS), engineer of fortifications and machinery, temp. Valentinian II (375-395). He wrote *Rei Militaris Instituta*, or *Epitome Rei Militaris*, a work not of much value. Several editions from 1473 have appeared, as well as a translation by Caxton, 1489. 59.

VELIA. A town on the south-west coast of the island of the same name, in the gulf of Quarnero, Illyria. The cathedral dedicated to the assumption of the Virgin Mary, dates 1183. There is an episcopal palace, a castle, and two monasteries. **NEALE**, *Notes on Dalmatia*, etc., 8vo., 1861. **JACKSON**, *Dalmatia*, 8vo., 1887, iii, 122-57. 50. 96.

VEII. A former city of Etruria. It was one of the earliest, nearest, and most formidable of the foes of Rome for four centuries. Soon after the time of Augustus (31 B.C.-14 A.D.) the city was a desolation, and a century later its very site was forgotten. It has been verified as close to Isola Farnese, a hamlet about eleven miles from Rome on the right of the via Cassia; and was once about seven miles in circuit. The city was mostly wealthy, renowned for its beauty, its arts and refinement, and equalled Athens and Rome in size; the superior magnificence of its public and private buildings was a temptation to the Romans to desert the Seven Hills. Veii was abandoned after the destruction of Rome by the Goths B.C. 389. Scarcely one Etruscan site has fewer remains; the *are* now piazzas d'armi, columbarium or Roman sepulchrum, ponte Sodo, a mass of rock bored through for a stream and the painted tomb are the chief objects; a few scattered fragments of walls, the sites of gates, and remains of several bridges. From the Roman forum were obtained twelve Ionic columns of marble now used in the portico of the post-office at Rome. In Feb. 1811 a number of columns, a fine statue of Tiberius (14-37) and others, were found placed in an orderly manner; **ACKERMANN**, *Repository of Arts*, 8vo., 1811, vi, 98. Of tunnels there is no lack; that called La Vaccareccia is crowned by trees; some have proved to be Roman; the tomb called La Grotta Campana, discovered 1842-3 by the marchese exists as first opened; it has two chambers, and is pre-eminent in point of antiquity. **CAMPANARI**, *Descr. de' Vasi dell' Isola Farnese*, etc., Rome, 1839, and review in *Bulletin Inst.*, 1840, p. 12-16: and **MICALI**, *Mon. Inditi*, 8vo. and fol., Flor., 1844, p. 156, pl. 27; p. 242, pl. 41. **CANINA**, *Etruria Marittima*, fol., Rome, 1846-49, i, pl. 29. **CANINA**, *L'Antica Città di Veji descritta*, fol., Rome, 1847. **NIBBY**, *D'intorni di Roma*, 3 vols., 8vo. and 4to., Rome, 1837, iii, 409-33, and 1841; also *Vingio Antiquario*, 8vo., Rome, 1819, i. **DENNIS**, *Etruria*, 3rd edit., 8vo., 1878; 1883, i, 1-42. **GELL**, *Topog. of Rome and its Vicinity*, 1834; new edit., 8vo., 1846. 14. 28.

VEINED MARBLE. See **MARBLE**.

VEINIER and **FINNIER**. Old ways of writing **VENER**.

VEITCHE (sir JOHN), knight, was master of the works at Holyrood palace. In 1633 he had caused "the abbey church to becom so lightsome that it gave us a great deal of contentment at our being ther"; as expressed in a letter 1641 from king Charles II. **SOCIETY OF ANTIQUARIES**, *Proceedings*, 4to., 1855, i, 113.

VEJOVIS or **VEDIUS** (TEMPLE TO). The little Jupiter, represented as a youthful god armed with arrows; also an Etruscan thunder-wielding god; DENNIS, *Etruria*, 8vo., 1878, 2nd edit. **VITRUVIUS**, iv, 7 or 8, refers to the temple to the beardless Jupiter (Vejovis). His temple at Rome stood between the capitol and the Tarpeian rock.

VELASCO (PEDRO DE), maestro mayor at the Alhambra, 1617 worked at the mole and fortifications at Gibraltar, and directed the second floor of the palace for Carlos V. He died before 1621, and was succeeded by F. de Potes, then *aparejador*. 66.

VELASQUEZ (ALEJANDRO). See GONZALES VELASQUEZ (A.). **VELASQUEZ** (FRANCISCO), worked with M. de Beza at Valladolid, wherein 1621 (?) they erected the third cloister and the façade of the porteria of N. S. del Prado; also 1621 the retablo mayor and silleria of the coro to the Benedictine church of S. Pablo, which is still in good order. 66.

VELASQUEZ (ISIDRO), rebuilt for Ferdinand VII (1808-33) the convent of Atocha founded 1523 for dominicans, at Madrid. The chapel contains the celebrated image of the Virgin, the patroness of the city. A. P. S.

VELDTEN and **VELTEN**. See **FELTERN** (JARRY ?).

VELLEIA and **VELLEIA**. The modern **LIVELIA**. A town of Liguria, in Gallia Cisalpina, situated about twenty miles south of Piacenza, and called "the Pompeii of northern Italy". Since 1760 when regular excavations were commenced, an amphitheatre, forum, temples, of at least the age of Trajan (98-117), and many buildings, were found, which from the walls being only ten feet high, presented the appearance of having been destroyed by a landslip (*temp.* Probus 276-282). The statues and other antiquities are deposited in the museum at Parma. **ANTOLINI**, *Rovine de Velleia*, fol., Milan, 1819-22. 14. 23. 25. 28.

VELEZ (JUAN and RODRIGO). Maestro mayors of Cuença, 1538 directed the waterworks of the cathedral and were succeeded 1559 by J. de Mendizabal. **BERRUGUETE**. 66.

VELEZ (DIEGO), 1581 maestro mayor at the cathedral at Oviedo; and 1583, June 6, renovated the bridge at Poago. 66.

VELEZ (MATEO), with F. Alvarado and others worked at the archivo at Simancas, near Valladolid. 66.

VELEZ DE LA HUERTA (JUAN and his son PEDRO), montañeses del lugar de Galicano, in the district of Trasmiera near Valladolid, 1611-17 contracted to erect the church and monastery of S. Francisco descalzos at Vitoria, in Spain, for over twenty-two thousand ducats. 66.

VELITRÆ. The modern **VELLETRI** in southern Italy.

VELLANO (GIACOMO), also a sculptor, of Padua, born about 1430, was a pupil of Donato (*i.e.*, Donatello), who left him all the preparations for the works in bronze for the choir of S. Antonio at Padua; two (the second and fifth) are by Andrea Riccio, also his master, and ten by Vellano. Being at Rome 1464, pope Paul II employed him in the works at the Vatican, under Giuliano da Majano; but he designed for him "a magnificent court with a graceful flight of steps", stopped by the death of the prelate. He also decorated the palazzo S. Marco (now di Venezia) at Rome, also designed 1468 by Majano for the pope, and sold to the republic by Clement VIII. He died at Padua in 1500 or 1502, aged 92 years, and was buried in the church of S. Antonio. 5. 28. 68. 73.

VELLAR CUPOLA. A term used by L. B. ALBERTI, to denote a dome or spherical surface terminated by four or more walls, frequently used over large staircases and saloons, and other lofty apartments. 1.

Velum is a term not in general use, but employed by Woods, *Letters of an Architect*, 4to., 1828, p. 437, in speaking of the new gallery called the Braccio Nuovo in the Vatican museum; "the central division is covered by a *velum*, that is by a cupola, the diameter of which is equal to the diagonal of the square, on which it rises, and of which, consequently, the sides are cut away. I do not much admire it." It might be more correct to describe it as "the dome or concave circular ceiling being cut away at its base by the sides of the square, or polygon, for it

may be either, inscribed within its circumference. Such ceiling or vault therefore assumes somewhat the appearance of an awning or *velum* stretched immediately upon arches." 14.

VELLASCO VIEGAS, distinguished 1162 in Portugal, and 1200 constructed the parish church of Cervaens in the archbishopric of Braga; in the side entrance is the inscription "Feita na era de mil ducentos annos. Dñi. 4. B. B. Vellasco Viegas me fecit." 66.

VELLEFAUX (CLAUDE), 1602—about 1626 almost rebuilt the hôtel Dieu at Paris, continued by his pupil Gamard. He also from 1607 directed the works at the hôpital de S. Louis, from the designs of Chatillon. **HUSSON**, *Etude sur les hôpitaux*, 4to., Paris, 1862, p. 14, 499. **LANCE**, *Dict. des Arch.*, 1872.

VELLEIA; see **VELEIA**, in northern Italy.

VELLETRI (Anc. Velitæ, founded by the Volsci). A town near Rome, in southern Italy. It has a large square with a statue of pope Urban VII, and several handsome fountains. The see is united with Ostia. The town was the original seat of the Octavian family, of which the emperor Augustus (31 B.C.-14 A.D.) was born here, and several of his successors as Caligula (37-41) had grand palaces. The colossal Minerva Pallas of Velletri and the capitoline Juno are of Parian marble. The theatre of the confratelli della Passione, xv cent., founded 1765, is given in **SEROUX D'AGINCOURT**, *History of Art*, fol., London, 1847, pl. 55. The cathedral dedicated to S. Clemente, was rebuilt 1660 by G. Dosi; the columns in the crypt belonged to ancient buildings. The church of Sta. Maria in Trivio has a lofty campanile with an inscription dated 1353. **MONE** **Toderigi** 1315 built the chapel of the confraternità della Croce di Giorno. The palazzo vescovile was erected 1575 by G. da Porta. In the palazzo pubblico, designed by Bramante, is an inscription referring to an amphitheatre of the time of Valens (364-375). The palazzo municipale 1822-35 is by G. Salvi. In the palazzo Ginnetti, now Lancelotti, is the staircase and loggia 1671 by M. Lunghi the younger, which is considered one of the staircases of Italy (*Illustrations*, pl. 37). The pictures in the handsome palazzo Borgia have been removed to Naples. **LECLÈRE**, *Recueil d'Architecture*, fol., Paris, 1826, gives pl. 36, a washing-place; pl. 43, the monastery of the Capucins de Julianello near the town; and pl. 85, plan of pal. Lancelotti. **PROVENZANI**, *Descr. degli acquidotti Vell.*, Rome, 1840. **BORGIA**, *Istoria*, etc., di Velletri, 4to., Nocera, 1723. **ROSSINI**, *Voyage Pitt.*, fol., 1839, pl. 33-4. **CASIMORO DA ROMA**, *Memorie Istoriche delle Chiese—della prov. Romana*, Rome, 1744. 25. 28. 50. 96.

VELLOIRE or **VELORE**. A town in north Arcot district, in the Madras presidency, situated on the river Palar. The extensive fortress built about 1274-83 has ramparts of huge stones with a deep wide ditch cut in the rock; it contains barracks, hospitals, magazines, and state prisons. In the town is an elaborately sculptured Vishnuite pagoda or choultry, erected about 1400 (an imperial folio of twenty-one drawings in pen and ink by a native artist about 1800, was for sale *cir.* 1870). The mosque of Chanda sahib. The sons of Tipoo sahib resided at Vellore from 1799 to 1806; the tomb of the family is described in **GOOD WORDS Journal**, Aug. 1869, p. 551. **BUCHANAN**, *Mysore*, 4to., 1807, i. **HUNTER**, *Imp. Gaz. of India*, 8vo., 1887. 50.

VELLUM. The prepared (unsplit) skin of a calf, kid, or lamb, tightened in a frame and the flayer's irregularities planed off; it is much used for illuminating and fine printing. **PARCHMENT**. 14.

VELOCITY. The rate of traversing space, measured by distance passed over in a given time, *e.g.*, by number of feet travelled per second. Angular velocity is the rate of turning and is measured by angle turned through in given time, *e.g.*, by number of revolutions made per minute. **IMPACT**.

VELTEN (J. M.). See **FELTERN** (J. M.).

VELUM; **VELARIUM**. The awning over the cavea of a Roman amphitheatre and theatre. **BURGESS**, *Topography and Antiquities of Rome*, 8vo., 1831, i, 246, sums up the curious particulars. He notices the corbels or consoles around the out-

side of the uppermost story of the Coliseum at Rome, at Pompeii, Orange, etc., within these were placed as many posts, headed and girt, as may be supposed, with brass or iron; they reached above the cornice and were finished at the top with rings. To those rings were attached cords, which were drawn horizontally, converging like radii towards a centre; and they were fastened at the concentrating end to a cord, encompassing, as it were, an elliptical space in the air corresponding to the arena, which was consequently uncovered: this cord or girth in the middle was sufficiently sustained by the converging ones. Along the latter ran the rings attached to each section of the canvas called the "velum", which might be drawn backwards or forwards at pleasure, with the facility of drawing a curtain. Perhaps some skill was required in managing the cordage; for sailors were expressly employed for the purpose. The velarium was probably constructed on the same principle in these buildings; for it is recorded that Caligula for his amusement sometimes ordered the "vela" to be drawn back during the scorching sun, when all the people were assembled, and it was forbidden for anyone to move from his seat. LUCRETIVS intimates that the vela were all painted different colours, and, when fluttering in the wind, produced a charming effect over the cavea. But Julius Caesar, in an amphitheatre constructed of wood, was extravagant enough to shade the operators by curtains of silk. *ÆLI LAMPRID. COMMOD. Ant.*, cap. xv. SUTTONIUS, in *Caligul.*, c. xxvi. LUCRETIVS, iv, 73, edit. Keat, London, 1824. DION CASSIUS, *Hist.*, xliii, 1. Among the moderns, LUCANGELLI; conte CARLI; UGGERI; GUATTANI; PARKER; BURN, have offered ingenious illustrations.

Pompeii, of the Society for the Diffusion of Useful Knowledge, 8vo., i, 255, 264, 290-4; ii, 10, over atrium. The theatre at Epidaurus does not afford any evidence that the spectators were protected from the weather; LEWIS, *Notes made during Tours in Greece*, read at ROY. INST. OF BRIT. ARCHITECTS, 1887, p. 91-2. VELLAR CUPOLA. *T. L. D. 1. 78.

VELVIS DE MONREY (Moorish; "fine prospect for my king"). A village in Caeres in Spain. An old strong and massive castle, latterly occupied by the inquisition, shows vestiges of places of torture, a block for decapitating, a trap-door to a very deep pit or oubliette, and lofty subterranean vaults. About a league from Almaraz is the famous bridge over the Tagus, erected 1552, of one pointed and one semi-circular arch, by Pedro de UÑAS. 66

VENANCE (JEAN), a Fleming, was employed on the villa Borghese at Rome. He is probably the same as Jan van SANTEN. 12.

VENDENHEIM (LAURENT DE), 1493-5 was engaged at the cathedral at Strassburg previous to J. de Landshut's appointment; SHNÉGANS; as in LANCE, *Diet. Arch.*

VENDOME (JEAN DE), early in XII cent. a monk of Vendome, was called to Mans to direct the works at the cathedral of that city. VOISIN, *N. D. de Mans*; LANCE, *Diet. Arch.*

VENEER. Finnier from Veinier (1708); or Ger. *furnieren*, from *furnish*, that is *put on*. "Finely finnier'd and its frame carved—communion table—of S. Stephen's Walbrook"; SEYMOUR, *London*, fol., 1735, i, 487. A thin leaf cut out of a valuable wood, to be laid upon a ground or foundation of inferior wood, as bay wood, common cedar, yellow pine, so as to produce articles at a smaller cost than if they were made entirely of the ornamental wood which appears on the surface. In the time of PLINY, *H. N.*, xiii, 29; xvi, 24-34, the art of veneering was a recent invention, and he descants on thus converting the cheaper into the most valuable woods; HOLTZAPFEL, *Descr. Catalogue*, 8vo., London, 1843, who describes the two methods of veneering in vogue, by screw clamps and cauls, and by the veneering hammer; also in BARNABY, in *Quarterly Journal of the Amateur Mechanical Society*, reprinted in *BUILDING NEWS Journal*, 1871, xxi, 99. "Vegetable substances" by SOC. FOR DIFF. OF USEFUL KNOWLEDGE, p. 171. BLACKIE, *Cabinet Maker's Assistant*, fol., 1853, p. 49. MARQUETRY is a more complicated

kind of veneering or inlaid work. BUHL. Veneered work will not stand in hot climates, for the scorching blasts of hot winds will start all glued-up work in a few seconds. 14.

The workshops erected at Battersea by I. Brunel had circular saws from 10 to 18 ft. diameter for cutting veneers; they were burnt 30 August 1814; GENTLEMAN'S MAGAZINE, lxxxiv, pt. 2, p. 286. BUILDER *Journal*, 1850, viii, 389, from MORNING CHRONICLE newspaper. Machines for cutting veneers from cylindrical blocks, ARCHITECT, ETC., *Journal*, 1850, ii, 163, 173. Chack's patent veneer cutting-machine, knife only, BUILDER *Journal*, 1855, ads. p. 7, col. 3. Shaving wood into veneers, BUILDER *Journal*, 1858, xvi, 323. Veneering with vulcanite, *idem*, 1856, xiv, 574; and MECHANICS' MAGAZINE. Xylopasty or veneer embossing, B. J., 1858, xvi, 859. Colouring veneers, *idem*, 1872, xxx, 283. Meadows' patent method of bending veneers round mouldings, 1849, in INSTITUTE OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1858, xvii, 36. ASHLAR WALL. GLUING UP. INCISED WORK. INCRUSTATION. INLaid WORK. LASTERICATION. MARBLE DECORATION. WALL VELL. 1. 14.

VENELLA. A narrow lane. ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1888, p. 340, referring to the church of St. Swithin, Lincoln.

VENEREUM. A place in a Roman house, if not consecrated to the goddess from whom it derives its name, at least especially devoted to her service. In the house of Sallust, at Pompeii, on the right of the atrium is a suite of apartments communicating only with it by a single passage having a door at each end and beside it the apartment of the slave porter. Its disposition shows that the strictest privacy had been studied.

VENETIAN BLIND. Called *ghilmil* at Calcutta. Fr. *jalousie*, under which it is explained. SUN-BLIND. In SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 501, occurs the words "non avea nè vetriate, nè imposte, o sciano scuri". Amongst the latest appliances are SOPER, lever action pulley; and HATTON, patent tubular clip Ven. blind action; and lever blind action. "Revolving Venetian shutters" are described in BUILDER *Journal*, 1866, xxiv, 453. RONDELET, *L'Art de Bâtir*, fol., Paris, 1812, pl. 140, 155. "New system of shutting them," in DALY, *Revue Générale*, viii, 1849, pl. 32. 1. 6. 11. 23.

VENETIAN CISTERN, TANK, or WELL. Venice has always depended for its drinking water on cisterns formed under the pavement of the courtyard of each house. Artesian wells were formed in 1847 to supply fountains in many of the squares. A description of such tanks is given by PARKER in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 4to., 1842, p. 187; another in BUILDING NEWS *Journal*, 1862, ix, 127. NOUVELLES ANNALES de la Construction, 1862, viii, pl. 32. COMPTES RENDUS de l'Acad. des Sciences, 25 July 1860. ALLG. BAUZEITUNG, 1836, p. 159, and pl. 556.

VENETIAN DENTIL. A molding consisting of a fillet with its sides cut alternately into notches, which reach the middle of the face, and produce the effect of a double row of dentils; as further explained s. v. DENTIL.

VENETIAN ENAMEL MOSAIC. On gold grounds was largely used in early Byzantine buildings. The first seen in England was in XIII cent. in the shrine of Edward the Confessor, and the tomb of Henry III. in Westminster abbey. About 1859 a poor glassblower of Murano, Lorenzo Radi, by his improvements in the decayed manufacture, attracted the attention of Dr. Salviati, and it met with success chiefly in England for mural decoration, where it was used in the vaulting of Wolsey's chapel at Windsor, S. Paul's cathedral, and other places. A. Cappello, fifteen years with Dr. Salviati in England, has also done works in it, as at the Brompton Oratory; BUILDING NEWS *Journal*, 1883, xlv, 586. MOSAIC WORK.

VENETIAN GLASS. Murano acquired celebrity early in XIII cent. as the seat of this manufacture long regarded as the finest in Europe; coloured glass was first made there in 1436. The lancet-shaped windows of the chapel attached to Sta. Maria

dell' Annunciata, at Padua, mostly retain the ancient Venetian glazing comprised of small circular panes of thick glass. MURANO. In 1612-18 it was made in London by artisans from Venice; STOW, edit. by STRYPE, fol. 1720, p. 112. *Making and names*, in *BUILDING NEWS Journal*, 1857, iii, 544. *ENCYCLOPEDIA BRITANNICA*, 8th edit., 1855, p. 659. GLASS (p. 46).

VENETIAN GREEN. A so-called emerald, or sap, green prepared from berries. EMERALD GREEN. 7.

VENETIAN PAVING. Veneziano Vermiculatum; terrazzo Veneziano in PAVEMENT (p. 66). TRAZZO. STUCCO.

VENETIAN RED or scarlet ochre; English red; Prussian red; red ochre; rouge de Mars. A native ochre; but also prepared from sulphate of iron, or its residuum in the manufacturing of acids. They are redder than light red and very permanent. 7.

VENETIAN SCHOOL OF ARCHITECTURE. The periods of the styles in Venice are arranged as follows: Romanesque, Romano-Christienne, Byzantine VII to end of XIII cent. Tedesco-Gothic, middle of XIII cent. to 1400 *cir.*; the church of S. Agostino at Bergamo, the first of this species on the Lombard side of Italy. In the Venetian Gothic the employment of horizontal bands of different colours is shown as a great feature, also at Siena and Florence; its use in the mosques at Cairo is well known. Early renaissance 1450 to 1520 (ITALIAN STYLE), a style which at Venice they term Lombardesque, being a revival in the XV cent., by the Lombardo family, of Roman art. Classic 1520 to 1620, comprising the names of M. San Michele, J. Tatti Sansovino, A. Palladio, S. Serlio, V. Scamozzi, Giov. da Ponte Contino, and A. Vittoria. Decadence from 1600. RUSKIN, *Stones of Venice*, 8vo., 1858-67, ii, 234, 281. "Secret of the Structural and Decorative peculiarities of Ven. Arch.", in *BUILDER Journal*, 1879, xxxviii, 527.

VENETIAN WINDOW; also called Palladian window, and Wyatt window. In the palazzo Trissini at Vicenza, by V. Scamozzi, is a window suggested by the loggia at the basilica by A. Palladio, employed not as one window but as three, forming the principal compartment of the front, and as such frequently employed at Venice. It is also used still larger in the palazzo Trenta by V. Scamozzi. 1.

ENEZIA (Lat. Venetia; Engl. Venice; Fr. Venise; Ger. Venedig). The city founded about 450, attained its climax after taking of Constantinople in 1204. It is about six Italian miles in circumference, and comprises 149 canals, of which seven are wide, 350 bridges; about 2,000 streets, lanes (*calla*), and alleys, separating the blocks of buildings on each islet; 28,000 houses of stone from quarries in the island of Brioni and from Rovigno, and of brick faced with marble; 70 parish churches, 54 monasteries, 26 nunneries, and 17 rich hospitals (99 churches and chapels in 1836). Several places (*campo*) are in the form of a khan, the *campo* S. Angelo remains; the principal one, *campo dei Mori* at Madonna del Orto is taken down, but the stone bas-relief of a Bedouin loading a camel is on the wall next the canal. The *piazza* di S. Marco, burnt, resembled the court of a mosque, as shown in a picture 1496 by Gentile Bellini exhibited in the Accademia. This piazza is 576 ft. long, 269 ft. wide next the campanile, 185 ft. at the west end; plan in C., i. The two columns of oriental granite 1172-80 (1176) by Nicolo il Barattiero; the brass statue of S. Theodore placed 1329 by Pietro Guilandardo; and the brass winged lion of 1178 about, placed in XV cent.; now portions of it date from 1816 (B. J., 1884, xlvii, 81; and 1887, lii, 77, 142). The torre dell' Orologio dates 1466; continued 1494-96-99 by P. Lombardo; and after 1505 wings added by him, completed 1510-5 by B. Buono; facade 1615 by B. d'Alessandro, il Manipolo; 1750 struck by lightning; 1755 restored by B. Ferracini, or 1755 eight columns added by T. Temanza; 1757 restored by A. Camerata; and 1859 again restored; C., i. The three red cedar flagstaffs (*pili*) are stepped in fine bronze pedestals (1) 1501 and (2) 1505 by A. Leopardo; C., ii. B. J., 1887, liii, 215 pl. *QUADRI, Le Piazze*

di S. Marco, fol., Ven., 1831. The Ridotto near, *cir.* 1740 by B. Maccarucci.

The ponte di Rialto (*rivo alto*, deep stream) was built 1172-80 by N. Barattiero; burnt 1412 (British Museum, Add. MS. 12,121); a model of it was made by G. Spavento and 1501-2 repairs done; burnt shortly after; 1587 recommended to be built of one arch by A. Paliari called Marco; rebuilt designed 1589-91 by Dionigi or Giov. Alvise or Aloisius Boldu or Boldo (not V. Scamozzi), and rebuilt 1689-99 by A. (Contino) Ponteuum or da Ponte who also designed the centering: the arch is 94 ft. 6 ins. span, about 4 ft. thick, 72 ft. wide, and 24.5 ft. above the water. RONDELET, *Essai historique sur le pont*, 4to., Paris, 1836; and MAGRINI, *Intorno il vero architetto del ponte*, 8vo., Ven., 1854, p. 12-9. CICOGNARA, i, which also gives *Plan dell' Isola di Rivoalto*, i. In 1855 and 1858 were erected also over the grand canal, two iron bridges by ... Neville, engineer, one near the railway, the second at the further end. The so-called railway bridge over the lagunes 1841-6 is about 1½ miles long, B. J., 1846, iv, 52. The fine equestrian statue of Bart. Colleoni of Bergamo 1488 was designed by A. Verrocchio, and the figure cast and pedestal erected 1496 by A. Leopardo; C., ii. The foundations of the buildings are described by BONI, in *Archivio Veneto*, Ser. ii, xxix, pt. 2, 1885.

Note.—Where C. occurs it refers to CICOGNARA's work and the volume in which is an illustration. The letters A. B. refer to ALLGEMEINE BAUZEITUNG. The buildings marked * are mentioned in Murray's *Handbook*.

San Marco*, the duomo since 1807. Founded 826 or 828, with east crypt or *confessione* having 60 columns; burnt 976, built 977-1071 supposed by Byzantine workmen; the crypt under nave 1043-71. This crypt cleared of rubbish and made watertight *circa* 1838 or 1866 by Meduna and Milesi, engineers, B. J., 1877, xxxv, 225-7, and is now used again (ARCHITECT Journal, July 1870, p. 60). The body of S. Marco removed 1830 from old crypt to high altar. 1106 fire; consecrated 1111. 1180-93 church restored by an architect from Constantinople; rood-screen along east face of central lantern; three altars given in C., i. 829 *cir.* two bronze doors: XIII cent. a bronze door; 1203 another; 1300 a third (*Illustrations*, Door (metal), pl. 118). 976 the *pala d'oro*; additions to it 1105, 1209, 1345, and 1330-47, C., i. A *pulpit*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1888, pl. 27, by Horsley. 1501 facade covered with marble, G. Spavento or maestro Zorzi. 1505-15 capella Zeno in narthex, by A. Leopardo and A. Lombardo, and completed perhaps by P. Lombardo. 1528-9 domes strengthened by iron bands, J. Tatti Sansovino; diameter of choir dome 30 Ven. ft.; of centre dome 36 ft. 1530-35 stalls of choir, J. Tatti. 1556-76 sacristy; *Illustrations*, pl. 65 and 66 coloured by Mr. T. H. Lewis (about 1848), gives the ceiling; bronze gates, J. Tatti; C., i. Great rose window of south transept; the metal framing given in A. B., 1844, pl. 597. Pavement of Opus Vermiculatum: it became undulating from settlements in the soil (attributed by STREET as imitating the waves of the sea), and much worn, as its 2 ins. were reduced in many places to ¼ of an inch, when in 1871 Salviati was employed to replace much of it; *Illustrations*, Pavement, coloured, pl. 216-7-8-9. MOYEN AGE MONUMENTALE gives part of the pavement and mosaic, pl. 148; some capitals pl. 72; and the ailes pl. 385. B. J., 1886, li, 372, 586. ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1887, paper by Brindley. *Illustrations*, Capital, pl. 58.

The four horses of copper, taken from Chios (according to A. MUSTOXIMI of Corfu, *Sui quattro cavalli della Bas. di S. Marco*, Padua, 1816) by Theodosius to the hippodrome at Constantinople, 1204-5 to Venice, 1797 to Paris, 1814-5 returned to Venice; BYRON, *Works*, edit. by Murray, 8vo., 1837, p. 770. Others say they were originally at Alexandria (*Handbook*). Other notices by CICOGNARA, 1815: BETTONI, 1815; DANDOLO, 1817; SCHLEGEL, 1816.

Campanile begun 888 or 902; 888-979. 1148-54 continued

with belfry, by A. Buono; or 1173-78 completed. 1369 restored by il Montagnana, and after fire 1400. 1510-16 new belfry attic and spire (*guglia*), B. Buono of Bergamo, 350 or 323 ft. high, 42 ft. wide; ascent by an inclined plane. 1540 loggetta on side, J. Tatti; finished by V. Scamozzi with others; C., i. 1750 bronze gates, cast by A. Gai (1684-1769), C., i, pl. 15; B. J., 1887, liii, pl. 9. *Filosi, Nar. ist. del Campanile*, Svo., 1745.

About 1870 north façade of palazzo restored. 1871 scaffolding still up inside and outside. 1875 *cir.* south façade, and much of the old pavement renewed; mosaics of the baptistery almost entirely replaced with new work, down to 1881. 1879 west front to be repaired or rebuilt on new lines to suit south face; B. J., xxxvii, 1253, 1284, 1331, 1334, 1352, 1364; xxxviii, *S. Marco gl' Inglesi e Noi*, 8, 26, Stevenson's report, 175, 691; xxxix, 169, 631 restoration stopped: xl, 168, 242; 1883, xlv, 378, SACCARDO, *La Bas. di S. Marco in Venezia nel suo passato e nel suo avvenire*, Ven., 1883. 1886, li, 545, 796 by Saccardo from the *Archivio Veneto*, Ser. 2, xxxii, pl. 2, 1886. 1888, liv, 9 and 12, pavement and arch. ARCHITECT *Journal*, Jan. 3, 1880, p. 11, on its restoration.

A good detailed description of the design of this edifice is in *BUILDER Journal*, 1869, xxvii, 37 and 77. *Illustrations*, Church plan, pl. 86. VISENTINI, *La Chiesa duale di S. Marco*, 4to., Ven., 1753—rare. *La Bas. di S. M.*, fol., 1761. RUBBI, *Diss. sopra il corpo di S. M.*, Svo., 1811. RUPP, *Chiesa principali d'Europa*, fol., Milan, 1824-31. PIAZZA, *La scale basilica di S. Marco*, 6 pl., fol., Ven., 1835. DOUCE, *Foundation Stone*, 4to., 1836. ALLG. BAUZEITUNG, 1844, pl. 596. G. KNIGHT, *Ecclesiastical Arch.*, fol., 1842-44, i. HUBSCH, *Altchristliche Kirchen*, etc., fol., Carls., 1858-61, pl. 43. KREUTZ, *La basilica di S. Marco*, lar. fol., 1878; and *Musci di S. Marco*, fol., 1854. YMARTE, *Venise, Histoire, Art*, etc., fol., Paris, 1878; transl. by Sitwell, Svo., 1880. SACCARDO, *Bas. di S. Marco*, 4to., Ven., 1883; and *Musci di S. Marco*, Svo., 1864. ONGANIA, *La basilica di S. Marco*, 4to. and fol., Ven., 1877-88, reviewed in *ROY. INST. OF BRIT. ARCHITECTS, Journal*, 1888-89, p. 9.

This list comprises the churches; of some no detailed information is found.

Albazia; see Sta. Maria della Misericordia.
S. Alvise; 1388 founded.
S. Andrea.
S. Antonio; xvii cent. end.
S. Antonio di Castello; 1347-49. G. Lanfrani; CARLEVARI, fol., 1703. Chapel and two tombs, 1540. C., ii.
SS. Apostoli on the campo*; 1750 reduced to present form by G. Pedolo.
The capella Cornaro 1575, by a Lombardo, perhaps T. Lombardo, or A. Leopardo rather than by G. Bergamo.
S. Barnaba; 1749 L. Boschetti.
S. Bartolomeo; 1723. Top of tower in B. J., 1888, liv, 222.
S. Basso or Bassa; burnt 1670; façade 1671-76 by G. Benoni or B. Longhena; C., i.
S. Benedetto; begun 1590; S. Sorella.
S. Biagio ora chiesa dell' I. R. Marina; xviii cent. Fil. Rossi.
S. Canciano; interior by a Lombardo. Capella Widmann, 1634 C. Moli. Another 1650 S. Rinaldi.
Canonici Lateranensi della Carità*; Corinthian atrium 42 ft. by 56 ft.; another 80 ft. by 66 ft. 1551-61, A. Palladio. The church 1561, A. Palladio; burnt 1610. C., ii. Interior remodelled by B. Lazzari 1827 for academy of fine arts and sciences.
De' Capucini Il Redentore, alla Giudecca*; interior 1578-80, A. Palladio. Choir behind altar. Large cloisters. C., ii. GAILLIARD, *Mons.*, iv. Carmini;
S. Cassiano*; 1611 rebuilt for sixth time.
Sta. Catarina delle Candele. No merit.
La Certosa;
S. Clemente; 1646 cap. di casa di Loreto.
S. Cristoforo;
Sta. Croce on canal grande; *cir.* 1590, A. Contini da Ponte.
Sta. Croce degli Armeni;
S. Elizabeth on the Lido. Mean. Tower on north side.
Cappella Emiliana a S. Murano; 1530 fin. about; Gug. da Bergamo. Hexagonal about 20 ft. or 28 ft. diameter.
SS. Ermagora e Fortunato; see Sta. Marcuola.
Sta. Eufemia;
S. Eustachio or S. Stac; 1678, by Grassi. Façade 1709, D. Rossi.

ARCH. PUB. SOC.

S. Fantino; . . . S. Lombardo and Chiona (SELVATICO, 297), not by Scarpagnino. C., ii. Cappella 1583 by J. Tatti.
Della Fava; see Sta. Maria di Consolazione.
S. Felice; xv cent.
S. Fosca;
S. Francesco di Paolo; xvi cent. end.
S. Francesco della Vigna*; Late Pointed, of brick; one nave. 1530 *cir.* J. Tatti, and S. Serlio. Interior 1534-35 J. Tatti with F. Giorgio. Façade and dome, 1562 A. Palladio. High altar 1649, B. Longhena. Tombs of seven dogs. C., ii. Cap. Gherardo, xviii cent. A. Cominelli. The tower in B. J., 1853, xi, 149.
The Friari; see Sta. Maria.
S. Gallo.
S. Geremia*; 1753 . . . Cominelli or Car. Corbellini. Square tower with pyramidal top.
SS. Gervasio e Protasio (S. Trovaso); 1028 before; 1583 by A. Palladio or pupil. C., ii.
Del Gesù; *cir.* 1800 G. A. Selva. Completed by A. Diedo.
I Gesuiti Sta. Maria del Rosario*; 1726-43, G. Massari, not D. Rossi.
I Gesuiti Sta. Maria Assunta; 1715-30 D. Rossi, also attributed to L. Pozzo. Interior, G. B. Fattoretto.
Old Church of the Jesuits; a Lombardi.
S. Giacomo Apostolo di Rialto*; 1194; rebuilt 1531. Insignificant. Plan, etc., in HUBSCH, *Altchrist.*, pl. 38-9.
S. Gimignano; in the piazza; demolished 1156-72. Rebuilt on another site 1503-5, Cristoforo del Legname. Again rebuilt 1555-6, J. Tatti, C., i. Pulled down 1807-10 to enlarge the royal palace.
S. Giobbe*; cappella maggiore, 1462-71 a Lombardi. Good Pointed square tower. Other Lombardesque chapels, xv cent. A. Roselli.
S. Giorgio Maggiore*; 1438 library for Cosimo, M. Michelozzo. Church cloister, and refectory, 1556-79, A. Palladio. Façade 1610 altered by V. Scamozzi, C., ii. High altar, C., ii. Interior decorated by M. Rosso. Sumptuous staircase, *cir.* 1700 B. Longhena (attributed to Palladio and to V. Scamozzi; *Illustrations*, 1848-49, pl. 236). Candelabra, *Illustrations*, pl. 54; and Furniture, pl. 47. The Campanile 1774. Tombs of three dogs.
S. Giorgio degli Schiavoni, or de' Dalmati*; 1551 after J. Tatti by lay brethren.
S. Giorgio de' Greci*; 1532 or 1552 Sante Lombardo and . . . Chiona; interior 1570 J. Tatti, C., ii.
S. Giorgio minore, de' Greci, xvii cent. Italian, for Orthodox Greeks.
S. Giorgio in Alga;
S. Giovanni Crisostomo*; . . . Seb. da Lugano; or 1489 Moro Lombardo and Seb. da Lugano; or T. Lombardo. Campanile and side chapels of transept by Moro Lombardo. 1575 rebuilt.
S. Giovanni Evangelista; portal and cortile 1481, a Lombardo; or T. or G. A. Lombardo, C., ii.
S. Giovanni Elemosinario; 1523 A. Scarpagnino, C., i. Greek cross.
SS. Giovanni e Paolo* or S. Zanipolo; Dominican; 1246-1395 Nicola da Pisa (?). Cruciform, oldest and largest after S. Marco; a counterpart of the Friari. The Westminster abbey of Venice, 300 ft. long. Works continued *cir.* 1300, fra B. da Bologna, and 1390 fra Bonvenuto. C., ii. Portal 1430 Bart. Buono. Monastery and portal 1490, a Lombardo. Cappella del Rosario, 1571 A. Vittoria. Cappella S. Domenico, 1690 A. Tiralì. A great fire at end of 1866; still under repair 1871. A glass window B. J., 1884, xlv, 404.
S. Giovanni in Oleo, or S. G. nuovo, or il Redentore redento; 1740 *cir.* M. Lucchesi.
S. Giovanni di Rialto;
S. Giovanni in Bragora; 1728 rebuilt.
S. Girolamo Oratorio; xvi cent. A. Vittoria; now Ateneo veneto.
S. Giuliano in Merceria; 1553 interior and exterior decorations J. Tatti and A. Vittoria.
S. Giuseppe, 1530; fine. Tomb of doge Grimani by V. Scamozzi, or Gir. Campagna.
Sta. Giustina nunnery; 1640. Desecrated. B. Longhena.
S. Gregorio*; xv cent. 2nd pointed. 1342 apse. Fine choir, Brick. Desecrated.
S. Jacopo dall' Orio; pulpit octagonal; columns of verde antique.
S. Jacopo di Rivoalto; one of the oldest churches.
S. Leonardo; 1770 *cir.* B. Maccarucci. Desecrated.
S. Leone or S. Lio; Cappella Gussoni; xv cent. a Lombardi, perhaps Tullio; restored 1783.
S. Lorenzo; 1595 interior, S. Sorella. Altar del Sac. xvi c. G. Campagna.
S. Luca;
Sta. Lucia; 1580, or 1609 altered by A. Palladio, monastery his last work.
LECLERE, *Recueil*, fol., Paris, 1826, pl. 18.
Madonna del Pianto; 1649 F. Contini.
S. Marcelliano;
S. Marcuola, or SS. Ermagora e Fortunato; 1736 G. Massari.
Sta. Maria (or La Maddalena); 1740 *cir.* T. Temanza. Dome 50 ft. C., ii.
Sta. Maria Formosa*; 1350 Paolo Barbetta; 1492; 1680 restored; 1692

altered, Marco Bergamasco. Two portals by V. Smeraldi. High altar 1487 by B. Vivarino. Fine campanile by F. Zucconi.

Sta. Maria Mater Domini; xv cent. a Lombardo; P. or T. Lombardo. Completed 1520 J. Tatti. Fine.

Sta. Maria del Giglio or Zobenigo; 1680-83 G. Sardi.

Sta. Maria Gloriosa de' Frari*; 1230-50, or first stone 1250. N. Pisano. The finest in Venice and most beautiful in Italy. The whole is vaulted. Campanile 1361 begun, Jacopo Celega, and completed 1396 P. P. Celega delle Masegne. A. B., pl. 237. STREET, *Brick, etc.* Now the archives of the old republic. Church stalls 1468 by G. P. or Marco di Venezia, B. J., 1888, liv, 284.

Sta. Maria (or Madonna) dell'Orto* or S. Cristoforo; 1350 Pisano school. "1392 hic jacet mag. Johannes de Sanctis lapicida," as inscription. 1473 façade. 1845-50 restored. Contarini chapel. Campanile 1480, 175 ft. high. C., ii.

Sta. Maria della Misericordia*, or Abbazia; x cent. P. and A. Lombardi. Façade 1659 C. Moli.

Sta. Maria della Pietà. Pictures.

Sta. Maria di Nazareth Carmelitana di Scalzi*; 1649-89 B. Longhena. Altar in front of chancel. Façade 1689 G. Sardi (since restored). Interior and high altar L. Pozzo.

Sta. Maria del Carmine*; 1318. Campanile restored to perpendicular 1688 G. Sardi. Good tombs.

Sta. Maria della Fava or della Consolazione; XVIII cent. A. Gaspara. Cappella maggiore, G. Massari.

Sta. Maria della Salute* for the P. P. Somaschi; 1631-56 B. Longhena. Dome 70 ft. diam. Plau said to be taken from COLONNA, *Hypnerotomachia Poliphili*, 4to, 1467 (1499). C., ii. KRAFFT, *Carpentry*, fol. Paris, 1805, pt. ii, pl. 72. *Ragguaglio delle Cose notabili*, 8vo., 1818. WARR, *Dynamics*, 8vo., 1851, p. 134.

Sta. Maria del Rosario; see I Gesuiti.

Sta. Maria de' Miracoli*; date unknown. Carried out 1481-89 P. Lombardo. Cappella del Santuario 1484 P. Lombardo. C., ii. WARRING AND MACQUOID, *Arch. Art.*, fol., 1850, pl. 28. BONI, *Sta. Maria, etc.*, 4to., Ven., 1887, and in B. J., lii, 711, 758; liv, 284.

S. Martino, near arsenal; interior 1514-40 J. Tatti.

S. Maurizio, Oratorio; XVIII cent. P. Zogari or Zaguri. Continued 1795 *cir.* façade G. A. Selva; completed by A. Diedo.

S. Moise*, near S. Marco; 1632 or 1683-88 A. Tremignan. The campanile in B. J., 1853, xi, 501.

S. Nicolo' de' Tolentini*; 1591-95 V. Scamozzi. Corinthian portico to facade and alterations 1700 *cir.* A. Tirali. C., i.

Ogni Santi; xvi cent. Tomb of P. Veronese, died 1588.

S. Pantaleone*; 1668-84 F. Comino.

S. Paolo or Polo; nine altars of costly marbles.

La Pietà sulla riva degli Schiavoni; 1736 *cir.* G. Massari.

S. Pietro e Paolo a Murano; . . .

S. Pietro Patriarcale, or di Castello*; old, on island of S. Pietro. The mother church down to 1807. Wide with a dome. Façade 1594-96 F. Smeraldi after Palladio. Interior renewed or remainder of the church 1621, G. Grapiglia. High altar and a chapel 1700 *cir.* B. Longhena. Campanile, fine, of stone, 1474-80 a Lombardo.

Priorato. Painted.

S. Raffaele; 1618 F. Contini.

Il Redentore; see De' Capuccini.

S. Rocco*; 1489 B. Bon or Buono. Cappella maggiore and chapels, 1495 Bart. Buono di Bergamo. Staircase 1517. Porta del Albergo 1547. Interior 1525 A. Scalfurotto. Façade next river P. Lombardo (?). Piazza façade rebuilt XVIII cent., B. Macarucci. Costly late Italian with wide nave. High altar xvi cent., Venturino squadratore with maestro Buono. C., ii. WARRING AND MACQUOID, *Arch. Art.*, fol., 1850, pl. 42.

Salute; see Sta. Maria della Salute.

S. Salvatore*; plan patriarchal cross. 1503 Tribune G. Spavento. 1506 plan and interior P. (not T.) Lombardo. Interior continued and cloister S. and Giulio Lombardo. 1531 J. Tatti. Façade 1663 G. Sardi or B. Longhena. Altar and lantern Gug. Bergamasco or V. Scamozzi. C., i. Additions, T. Lombardo, C., i. Tomb of doge F. Venier 1556 by J. Tatti.

S. Samuele, old. Small with an apse. 1685 rebuilt.

Scalzi; see Sta. Maria di Scalzi.

S. Sebastiano*; 1506 F. Castiglione. Interior 1506 S. Serlio. Façade 1523 by A. Scarpagni (also 1584 J. Tatti). Repaired 1877. Nave without aisle, and chancel.

S. Silvestro, south of the Rialto; XVIII cent. restored or rebuilt. Ancient lofty square tower.

S. Simeone profeta, il grande; x cent.

SS. Simeone e Giuda; restored and dome 1718 G. Scalfurotto. C., ii.

S. Simeone minore or Piccolo; 1718-38 restored G. Scalfurotto.

Spirito Santo; 1536 *cir.* J. Tatti. Choir and façade a Lombardo. All destroyed.

S. Stac; see S. Eustachio.

S. Stefano*; 1294-1320 or 1325. Interesting. All of brick. Broad nave with aisles, all vaulted. Portal xv cent. attributed to P. P. Celega delle Masegne, that of the sacristy 1534 for G. Agostiniano, and cloister. Tombs of two doges. Restored.

S. Teodoro; façade XVII cent. G. Sardi.

Sta. Teresa; XVII cent. A. Cominelli.

I Tolentini; see S. Nicolo.

S. Tomà or Toumaso; 1742 F. Bognolo.

S. Tommaso; 1688 *cir.* A. Tremignan.

S. Trovaso; see SS. Gervasio e Protasio.

S. Vitale; façade 1700 A. Tirali. No chancel.

S. Zanipolo; see SS. Giovanni e Paolo*.

S. Zaccaria*; founded 817; formerly a nunnery church. Five-sided apse with aisle and chapels 1457 M. or A. Lombardo. Interior *cir.* 1456 unknown. 1477 Antonio di Marco was *proto*. C., ii. West front modern Italian. Detached square campanile at south-west of nave. GAILHABAUD, *Mon.*, iv. The apse in *Illustrations*, pl. 9.

Della Zitelle alla Giudecca; 1580 *cir.* A. Palladio carried out by J. Bozzetto. C., ii.

List of books on the churches, tombs and monasteries:—

ECCLESIOLOGIST *Journal*, 1867, *The Churches of Venice*, p. 35; and S. Marco, p. 65. CORNER or CORNARO, *Notizie Storiche delle Chiese e Monasteri di Venezia*, 4to., Padua, 1749; 1758. SORAVIA, *La Chiesa di Ven.*, 8vo., Ven., 1822. TOSINI e LAZZARI, *Vedute, etc., degli interni di tempi, etc.*, 1823. Several fine tombs are given in CIOGNARA, *Venezia*, fol., 1815-20. The doge Vendramini in GAILHABAUD, *Monuments*, iv; and in GRANDJEAN, *Plus beaux tombeaux*, fol., Paris, 1875. CIOGNARA, *Mont. Sepulcrali*, fol., 1858.

Monasteries:—Fratelli Minori, by Nicola da Pisa; di Sta. Croce on canal grande, by G. Contino da Ponte; and della Celestia; church by V. Scamozzi; and 1500-50 collegio dei Mercanti da Vio, near the church of S. Silvestro, by . . . Chiona. Scuola del Corpus Domini; A. Vittoria. Scuola della Carità; 1740 *cir.* by G. Massari; façade continued by B. Maccarucci. Scuola di S. Giovanni degli Schiavoni; *cir.* 15. . . by J. Tatti. Scuola della Misericordia, xv cent. B. Bon; 1508 model by A. Leopardo; 1515 continued by P. and A. Lombardo; 1532 continued by J. Tatti; façade by C. Moli. Scuola di S. Marco ora spedale civico, after 1485 by M. Lombardo assisted by Moro Lombardo (and fra Colonna); carvings by B. Bon and T. Lombardo; C., ii; restored, A. B., pl. 239. Scuola S. Rocco, for burial of the dead; *cir.* 1495 by Bart. Buono di Bergamo; or 1517-24 by B. Buono or S. Serlio; continued 1524-27 by S. Lombardo; water façade, etc., by S. or P. Lombardo; continued 1527-37, stairs 1517 and porta d'albergo by A. Scarpagni; completed 1550; A. B., pl. 241: BARCLAY, *Notes on, and its Decorations by Tintoretto*, 8vo., 1876: B. N. J., v, 179, 191. Scuola di S. Teodoro; façade by G. Sardi. Scuola di S. Girolamo, a fine work by A. Vittoria. Scuola del Rosario, XVIII cent. by F. Rossi. Scuola or Oratorio di S. Pasquale; pseudo-classical, now Sunday school.

The dates of the doges' palace given in SELVATICO, RUSKIN and STREET differ. The following have been collected from various sources, and should be compared.

Palazzo Ducale*, or the palace of the Doge; 1309-1500 about. The very noblest and truest specimen of Christian architecture south of the Alps; STREET, *Brick, etc.*, p. 148.

xiv cent. early. P. Baseggio, 1340 sala del consiglio. 1300-40. Two stages of south front next sea and returns east and west (17 arches). S.E. angle 1300, S.W. angle 1340. 1341 (?). Third tall story 1350-1400. 1310-34 or 1354-55. Sala del maggior consiglio (now library) and Sala della Scrutinio (now for MSS., etc.) on west side. F. Calendario. The sala is 175.5 by 84 and 51½ high. 1354 before. The loggia towards the (south side) water and 8 or 12 columns (west pier) of piazzetta or broglio (out of 18 arches). F. Calendario. 1350-1450 or 1390. The remainder of the columns (northwards) (7th and following columns). 1361. The large Gothic window towards the molo; by P. Baseggio; or 1404 by Bart. Buono succeeded by F. Calendario; C., i. 1424-1463. The façade.

- 1420-71. Colonnade next the sea and first six columns of the piazzetta (the larger ones); and
- 1423-39, 1439-43. The first thirteen columns southwards from the porta della Carità by Bortolomei Buono della Madonna dell'Orto, and the passage leading from it into the great inner court. MOYEN AGE MONUMENTALE, iii, pl. 46; are all by the family Bon or Buono; Giovanni the father, Pantaleone, Zane and Rosso, sons, and Bartolomeo son of Zuane, tajapiera; C., i. B. J., 1888, iv, 10.
- 1482-1500. Façade next the canal or prison and east façade of the court: Ant. Rizzi, or Riccio, not Bregno; C., i. B. J., 1847, v, p. 314. Portone di legno. Ant. Bregni and Scarpagnino, C., i.
- 1400 or 1471. Statues of Adam and Eve, Ant. Riccio.
- 1489-1500. Scala dei Giganti; Ant. Riccio, not Bregni and Scarpagnino, C., i. BUILDING NEWS Journal, 1859, v, 713, by Macquoid.
1493. Painters superintended by B. Buono of Bergamo.
1499. Ceiling repaired of great council chamber, G. Spavento.
- 1499-1511. Works by P. Lombardo.
- 1501 after; 1530 cir. Left hand of staircase, façade of two stories; P. Lombardo rather than G. Bergamasco.
- 1523-38. The large window towards the piazzetta; T. Lombardo and G. Bergamasco.
- 1537 cir. Façade in piazza completed, A. Scarpagnino.
- 1545-50, 1550-59. Court completed, east and north sides, A. Scarpagnino, with A. Bregni, il Riccio, C., i. 1559 portion north of the Scala dei Giganti.
- 1538-56-77. Scala d' Oro completed, J. Tatti; painted by Volta, and stuccoes by A. Vittoria, C., i.
- 1556-59. Bronze cisterns, putrel, N. de Conti and A. Alborghetti.
1566. Statues of Mars and Neptune, etc., J. Tatti.
1574. Sala del quattro porte, A. Palladio; ceiling by him and J. Tatti; done by A. Vittoria; C., i.
1577. After the fire; Porta del Collegio, Sala del Collegio, and Anticollégio or guard-room, restored A. and G. da Ponte Contini.
- 1577 after. Palace restored after the fire, by A. Palladi called Marco, or by A. Palladio.
- 1592-97. Ponte dei Sospiri or bridge of sighs, Ant. and G. da Ponte Contino; one arch, 33 ft. above the water.
- Porta detto della gran Guardia, V. Scamozzi (?), C., i.
- 1602-15. Seventy of the large columns in the cortile taken out and replaced by B. di Alessandro, il manopola.
1678. Palace restored, A. da Ponte.
- 1780 cir. Sala de' Banchetti restored, B. Maccarucci.
- The sala de' pregadi or senate remains in its original state.
- Sala degli Ambasciatori, in KOHLER, Polychromatic Masterpieces, fol. Leipzig, 1870-71, pl. 12.
1879. The Fig-tree column at south-west angle restored; Forcellini, engineer of shoring, BUILDING Journal, 1871, xxix, 423; 1879, xxxvii, 722; and 1882, xliii, 12.
- Sotto pioni or rooms under the leads, are now lumber-rooms and dwellings. Pozzi or cells in two lower stories.
- Biblioteca di S. Marco, and museo archeologico are now located here. Two cammino in C., i.
- The loggia has lost its stylobate of three steps, making the piazza, etc., of same level as the inner court.

Books on the ducal palace:—

- CADORIN, *Pareri de XV architetti e Not. Stor. intorno al pal. Ducale*, 8vo., Ven., 1838. ZANOTTO, *Il pal. Duc. illust.*, 4 vols., 45 pl., 4to., Ven., 1842; 1846-61. BURGESS AND DIBRON, *Chapiteaux du palais ducal*, 4to., 1847; also STREET, 1875, at end.
- ALLO. BAUZEITUNG, 1849, pl. 237. The palace and piazzetta in MOYEN AGE MONUMENTALE, iii, pl. 301.
- The chief palaces are as follows. Some are perhaps placed under two names, old and new.
- Antico a SS. Apostoli; XII cent.
- Badoaro Partecipazio*; cir. 1310. Restored cir. 1870.
- Balbi a canal grande; 1582 A. Vittoria.
- Barbarigo della Terrassa* 1532 J. Tatti. Titian here painted his last picture.
- Barbaro; (STREET).
- Bataggia; 1700 cir. B. Longhena.
- Bembo*; 1350-89.
- Bembo a canal grande; 1530 cir. M. San Michele (not S. Serlio).
- Bernardo*; XIV cent. Fine work. A. B., pl. 237.
- Bevilacqua; see Pesaro.
- Bragadini a Sta. Marina; . . . M. San Michele.
- Bressa;
- Busenello; XII cent. N. Barattieri (?).
- Cadore. A. B., pl. 236.
- Calergi; see Vendramini.

- de' Camerlenghi a Rialto*; 1525 finished, G. di Bergamo, or M. San Michele. Rich work. C., i. Now the tribunale d'appello. A. B., pl. 240.
- Capello a S. Apollinare*; 1563 before.
- Capello; see Trevisano.
- Capovilla; 1680 cir. B. Longhena.
- Cavalli*; XV cent. Now count de Chambord. See Cadore. A. B., pl. 236.
- Cavriani S. Maurizio; XVI cent.
- Cicogna ora Pajaro; XIV cent. (STREET).
- Contarini alle poste a S. Luca; 1530 cir. a Lombardo. C., ii. Good execution.
- Contarini a SS. Gervasio e Protasio; 1609 cir. V. Scamozzi. C., i.
- Contarini a S. Samuele or delle Figure; 1504-46 rather Bramantesque. 1504-56 a Lombardo. C., i.
- Contarini or Ca Contarini Fasan a canal grande*; XIV cent. early or XV cent. Pisano school. It has perhaps the only specimen in Venice of a traceried balcony. Façade restored 1857. B. J., 1883, xlv, pl. 412.
- Contarini a S. Vito a canal grande; . . . A. Procaccio, or 1504-46 by a late Lombardi.
- Contarini a San Trovaso, delle Scrigni a canal grande; 1609 V. Scamozzi. A second palace, XV cent. One of these palaces in A. B., pl. 242. English church now in one.
- Cornaro* (or Corner Spinelli) a S. Angelo; XVI cent. P. or S. Lombardo; a Lombardo; or G. di Bergamo. 1548 cir. part of interior modernised, M. San Michele. C., i. A. B., pl. 238. (Taghioni's, for her self, one of five.) B. J., 1851, ix, 530; 74 ft. long, 64 ft. high. Illustrations, pl. 133.
- Cornaro Mocenigo a S. Paolo*; façade 1548 M. San Michele, and the pavilion des Nymphes. C., ii. ? A. B., pl. 241.
- Cornaro a S. Maurizio*; 1532-33, J. Tatti, C., i. Interior altered after the fire of 1817; now prefecture of the province.
- Corner della Regina a canal grande*; 1724 D. Rossi, now Monte de' pietà.
- Corner a Murano; XVI cent. V. Scamozzi.
- Cussoni al ponte di Noale a canal grande; . . . M. San Michele.
- Donà; XII cent. N. Barattieri (?).
- Donato*; XII cent. style Byzantine Lombard.
- Dandolo*; XIII cent. A small part has rich Gothic work.
- Dolfin or Delino (later Manin Tiepolo) a S. Salvatore*; 1560 cir. J. Tatti. Interior rearranged 1780 G. A. Selva. Now National Bank.
- Dario*; XV cent. a Lombardi.
- Emo; see Trivies.
- Facanoni*; XV cent. Now post-office.
- Faler*; XIII cent. Out of this palace doge Marino was led to execution 1355.
- Farsetti*; XII and XVI cent. N. Barattieri (?). Now the municipio.
- Ferri*; XIV cent.
- Fino* a canal grande; 1688 A. Tremignan. } Part of the grand hotel.
- Flangini a S. Gervasio; . . . Perhaps pupil of B. Longhena.
- Foscari a S. Pantaleone*; 1460 cir., or end of XV cent. B. Buono della Madonna del'Orto. Fine of the period. C., i. GAILHABAUD, Mms., iii. MOYEN AGE MON., iii, pl. 153. Restored 1867. Now Scuola Tecnica di Commercio.
- Galvagna; see Savorgnan.
- Giovanelli S. Fosca*; XV pointed. F. Calendario. 1847 restored.
- Giustiniani a S. Vitale*; . . . B. Longhena (?). Now Europa hotel.
- Giustiniana*, two palazzi; XV cent.
- Giustiniana Lolini a S. Vitale; 1680 cir. B. Longhena. Now duchess of Parma.
- Gradenigo a S. Samuele; . . . S. Lombardo. Supposed destroyed.
- Grassi a canal grande*; 1745 G. Massari; now Sina, banker.
- Grimani a S. Luca*; 1595 M. San Michele. Upper portions by others. C., i. Now the post-office, or courts of justice.
- Grimani a S. Paolo; XVI cent. L. Lombardo; not M. Lombardo.
- Grimani a S. Toua*; XVI cent. M. San Michele. Dismantled.
- Grimani a S. Maria Formosa*; 1548 cir. chief door M. San Michele. C., ii.
- Grimani a canal grande; . . . M. San Michele; not by S. Serlio. In one of these is a large rotunda for casts; 1547 (?) J. Tatti. One of these in A. B., pl. 242.
- Labia*; 1750 . . . Cominelli.
- Larghi;
- Leze or da Leze alla Misericordia; 1700 cir. B. Longhena.
- Lolin; 1680 cir. B. Longhena.
- Loredano*; XII cent. Saracenic style. Now the municipio.
- Loredano a campo S. Stefano*; XVI cent., rebuilt.
- Loredano; see Vendramini.
- Manfrin*; . . . plain. Gallery of good paintings.
- Manin Tiepolo*; see Dolfin or Delino.
- Manin a campo S. Paternian*; 1848-75.
- Manzoni*; XV cent. a Lombardo. Waring and Macquoid, Arch. Art. fol., 1850, pl. 24. Cinque cento.
- Michieli delle Colonne*; ground floor XIV cent.; upper part XVII cent.

Mocenigo*; XVI cent. Three palazzi.
 Mocenigo*; see Cornaro Mocenigo.
 Moretta; see Pisano Moretta.
 Moro a campo del Carmine*; ...
 Moro Lin a S. Samuele*; 1570 S. Mazzoni.
 Morosini (later Sagredo)*; XIII cent. Majestic staircase . . . A. Tirali.
 Morosini a campo S. Stefano*; XVII cent.
 Morosini a S. Cantiano . . . B. Longhena.
 Del Patriarca; XIX cent. L. Santi.
 dei Pergoli Intagliati a canal grande; temp. Cad' Oro. B. J., 1851, ix, 170.
 Pesaro; (STREET).
 Pesaro, now Bevilacqua*; 1679 B. Longhena. BUILDING NEWS JOURNAL, 1860, vi, 823-7. A. B., pl. 243.
 Pisani S. Toma a canal grande; XV cent.
 Pisani S. Stefano; XVII cent.
 Pisani Moretta; (STREET).
 Pisano*; . . . Staircase in *Illustrations*, pl. 239; the steps are 9 ft. wide. Very large palace; now a girls' school.
 Pisano a S. Paolo*; 1400 *cir.* Fine of the period. C., i.
 Piovence; XVI cent.
 dei Poli, corte del Sabbionera; . . . Only a good Arabo-Byzantine doorway; Marco Polo born here 1265, died here 1525. YULE, *Travels of Polo*, 1876. B. J., xli, 347.
 Priuli; see Ruzzini.
 Regio; 1810. G. Soli; 1822 reformed partly, L. Santi.
 Rezzonico*; 1680 B. Longhena; 1740 third order or upper floor added, G. Massari.
 Ruzzini, later Priuli, S. Maria Formosa; 1615 *cir.* B. d' Alessandro, il monopola.
 Sagredo; see Morosini.
 Saudi in corte dell' Albergo; 1721 D. Rossi.
 Sanudo a S. M. di Miracoli*; early XIV cent. Gothic.
 Savorgnan ora Galvagna a canal regio; . . . G. Sardi.
 Savorniano*; . . . now duke of Modena.
 Soranzo;
 Spinelli; see Cornaro Spinelli.
 Surian a canal regio; . . . G. Sardi.
 Tiepolo*; see Manin.
 Topan; XV cent.
 Trèves formerly Emo*; XVII cent.
 Trevisano al ponte Canonica; 1530 *cir.* a Lombardo; or G. di Bergamo. A. B., pl. 240.
 Trevisano a Sta. Maria Formosa*; 1530 (later Capello 1577) S. Lombardo; or G. da Bergamo. C., ii. A. B., pl. 239.
 Valmarana*; XVIII cent. A. Visentini. Interior, A. Selva.
 Lorelano-Vendramini-Calergi*; 1481-84. Cinque cento. P. Lombardo. C., ii. XVI cent. garden wing by V. Scamozzi. 1681 belonged to duke of Brunswick, then to duke of Mantua; the Calergi, Vendramini, 1844 duchess of Berri; and count de Chambord. A. B., pl. 238.
 Vidimano a S. Canciano; 1700 *cir.* B. Longhena.
 Zanobrio, Zenobio, or Zanobio a Carmini; XVIII cent. A. Gaspari.
 Loggia in garden. T. Temanza. C., ii.
 Zen; 1531 F. Zen.
 Franc. Zen; three palazzi; . . . S. Serlio, attributed.
 Zorzi; XV cent.
 Zuane a rio di S. Agostino; . . . B. Longhena.

Cad' Oro*; XIII, XIV, or XV cent. C., i. Attributed to F. Calendario, but is by G. Bon. Façade as intended is given in B. J., 1886, li, 802; and in ENCYC. BRIT., 9th edit., 1888, xxiv, 148, from BONI, *Cad' Oro and its embellishments*, ROY. INST. OF BRIT. ARCHITECTS, *Proceedings*, Feb. 1886, and p. 122. Restored 1843 for madame Taglioni; now by Herrera, banker.
 Ca Contarini Fasan; see pal. Contarini.
 Casa Mangilli; 1780; and casa for Guido Erizzo, 1780, both by G. A. Selva.
 Casa Visetti; XVI cent. Near ponte di S. Antonio; B. J., 1851, ix, 330.

Scala del Maltese* a campo del Maltese, has a good XV cent. twisted renaissance staircase.
 Scala del Bovolo; ALLG. BAUZ., 1842, pl. 455.
 Scala to house on one side of Corte del Remer (STREET).

Among the public edifices, some others being noted among the palaces, are:—

Procuratie Vecchie on north side of the piazza; 1500-17, of 50 arches, 252-6 mètres long; P. Lombardo and perhaps G. da Bergamo and Bart. Buono of Bergamo; C., i. *Fabbriche Nuove a Rialto**; 1555 J. Tatti; arcade of 25 arches south side; C., i. *Fabbriche Vecchie a Rialto*; XIV cent.; burnt 1513, rebuilt A. Scarpigni; C., i. *Procuratie Nuove* on south side;

1584 V. Scamozzi, who continued on the upper or third floor for 13 arches in addition to the three by J. Tatti. C., i; GAILHARBAUD, *Mons.*, iv; completed 1638-40-82 Marco della Carità and B. Longhena; later the palace of Eugène Beauharnais; library now in part of palazzo reale. *Fabbrica Nuova* or palazzo reale; west end, 1810-14 by Gius. Soli with staircase; C., i; alterations, etc., Lor. Santi. Biblioteca or *Libreria Vecchie* or antica; ceiling 1530 *cir.*; 1536-47 additions by J. Tatti; rich details; C., i; A. B., pl. 241; Sala, etc., completed 1582, V. Scamozzi; GAILHARBAUD, *Mons.*, iv. Books removed 1812 to ducal palace; it now forms part of the palazzo reale. The picture gallery, in ALL. BAUZ., 1836, pl. 78. *Zecca* or mint; 1535-36 of stone and iron, J. Tatti. C., i; cortile . . . by V. Scamozzi; since 1870 the chamber of commerce and exchange. *Pubbliche Prigione* or Carceri for 400 or 500, a quadrangle; 1589 Ant. da and G. da Ponte Contino; C., i; the porta d'Albergo and the portone di legno in the façade 1547 *cir.* A. Scarpigni with Ant. Bregno. The *Lazaretto* vecchio, after 1448; B. Buono 1493 engaged on the works; it was the earliest of its sort, and its rules were adopted by other European establishments; HOWARD, *Account*, etc., 4to, Warrington, 1789, with a plan. The Lazaretto nuovo with the quarantine establishment, all on one of the islands. The ospedale degl' Incurabili has an elliptical church *cir.* 1514 by J. Tatti; the gate to it, 1580, *cir.* A. da Ponte Contino. Spedale di S. Lazzaro de' Mendicanti, ora Spedale civico, by V. Scamozzi; the façade to the church and hospital 1673 by G. Sardi. C., ii. Ospedaletto near SS. Giovanni e Paolo, *cir.* 1750, M. Lucchesi; façade by B. Longhena. *Fondaco dei Turchi a Rialto**, XII and XIII cent., 1506 fra. Giocondo of Verona; a capital in HUBSCH, pl. 25. C., i; given by the republic to the duke of Ferrara—to Pesaro family—1621 let by them to the Turks; 1869 restored and repaired, *i.e.*, rebuilt; now the municipal museum. *Fondaco dei Tedeschi*, burnt Feb. 1504; rebuilt 19 June 1519, Girolamo Tedesco (Hieronymus Thodescho) of Augsburg (as THAUSING, *Albert Dürer*, translated by F. A. Eaton, 8vo., 1882, p. 339; described by SANSONO, *Venezia*, 1581, p. 133). It has been attributed to Giov. Giocondo, and to P. with his sons T. and A. Lombardo (by TEMANZA). The pavement 1500 *cir.* to the *peschiera* by P. Lombardo. The Dr. Rina bathing and swimming baths on the Lido, ALLGEMEINE BAUZEITUNG, 1836, pl. 63. Public gardens, buildings, etc., 1807-10 by G. A. Selva, plan at end of C., ii. The theatres:—La Fenice*, place S. Fantino; 1789-91 G. A. Selva; for 3,000 persons, one of the largest in Italy; C., ii; rebuilt after the fire of 12 Dec. 1837, by T. Meduna, engineer, and G. B. Meduna; ALLG. BAUZ., 1842, pl. 488. S. Benedetto, Rossini, or Gallo*, 1755, in MORELLI, *Nouveau teatro d'Imola*, fol., Rome, 1780; Malibran*, XVII cent.; Apollo; and S. Samuele.

The arsenal was commenced 1104, continued 1304 by Andrea Pisano (from 1307-20 it was two miles in extent); additions 1312-26, F. Calendario (SELVATICO, p. 111); continued 1475 and 1557. The portal burnt 1180, rebuilt 1460 or 1480 and attic added 1581, C., ii. The cable store-house or *la tana*, rope-walk, 910 ft. long, 1579 Ant. da Ponte Contino, and perhaps partly rebuilt early XVIII cent. with 92 Doric columns; continued 1810. The gate at the land entrance has several statues; the two (or four) marble lions were brought from the porto Leone at Athens in 1687 by doge Morosini, C., ii. The porta del deposito del Bucintoro (boat burnt 1824) M. San Michele; C., ii. The mole, before 1846, is described in INSTITUTION OF CIVIL ENGINEERS, vi, 128 (see *isle Palestrina*); the new mole is 6,700 ft. into the sea, B. J., 1846, iv, 112. La Dogana del Mare* had two designs for it made by B. Longhena. The fine loggia and tower, erected 1676-82 Gius. Benoni, C., ii, completed 1835 . . . Pigazzi. 1876 new warehousing docks erected, and two large graving docks, 17 and 20 ft. deep.

Illustrations, besides those named in the text, examples will be found under Brickwork, pl. 42; Buttress, pl. 44; Campanile, pl. 48; Chimney, pl. 73; Chimney-top, pl. 76; Corbel,

pl. 95; Cornice (brick), pl. 102; Doorway, pl. 120; twelve examples of Grille, pl. 162 and 163; Metal work, pl. 205.

Of the islands of interest, MURANO, CHIOGGIA, and TORCELLO are already noticed. *Sant' Elena*; her remains buried here *cir.* XII cent. from Constantinople; 1418-27 by R. A. and C. da Milano; of Pointed brick; the *porta* by A. Dentone, end of XV cent.; CICOGNARA, ii; demolished 1888, now military stores. *S. Clemente*; new female lunatic asylum, 1876, consisting of nine large courtyards, 300 rooms for 600 persons besides attendants; B. J., 1876, xxxiv, 1119. *Malamocco*; residence of the early doges. . . . S. Servolo, small, late Italian; now a lunatic asylum. *S. Lazaro*; monastery of Armenian monks, with large library. *Buranò*; church of S. Martino, late Italian. *Mazorto*; high campanile of same kind as that of S. Marco. The fortress of *S. Andrea del Lido*; 1541-71 by M. San Michele. *Marana*; restored and fortified *cir.* 1570 by M. San Michele, where he designed the nunnery of S. Biagio Catoldo at the guidecca. C., ii. GAILHABAUD Mons., iv. *Paestrina*; near it are the *murazzi*, breakwaters, made of large blocks of marble on piling, and rising 10 ft. above high water.

Plan No. 209, and environs No. 210, of maps of the Society for the Diffusion of Useful Knowledge.

Guides:—*Il gran teatro di V.*, fol., 1720. ZUCCHI, *Teatro delle fab. delle città*. ZUCCHI, *Forestiare illuminato intorno, etc.*, 12mo, 1761. ZOMPINI, *Le Arti che vanno per Via nella città*, fol., 1785. MAIER, *Besch. von Ven.*, 8vo., Leipzig, 1795-6. MURRAY, *Handbook to Northern Italy. Venice described*, 24mo., London, 1851. *Guida*, 12mo., Ven., 1842. QUADRI, *Otto giorni in Ven.*, 1822; 1828. ESTENSO SELVATICO, *Guida*, Ven., 1852. FORBIN, *Un mois à Venise*, Paris, 1825. MOSCHINI, *Guida*, 12mo., Ven., 1815; 1828. SELVATICO, *Guida Artistica, etc.*, 12mo., Ven., 1852. FALLIN E MOLMENTI, *Venetia*, from the notes of Lazzari, 1888. CORNARO, *Notizie di Ven.*, 1758.

Views, etc., of the Edifices:—*Isole famose porti, fortezze, e Lerre Marittime di Ven.*, 88 pl., 4to., Ven., 1571. ALBERTI, *Ginocchi festii, etc.*, fol., 1686. CORONELLI, *Palazzi di Venezia*, 3 vol., Ven., n.d. CANALETTI, *Urbis Ven. prospectus celebriores*, 38 pl., 1742-51. CARLEVARIS, *Le fabbriche e Vedute di Ven.*, 103 pl., 4to., Ven., 1703. MARIESCHI, *Magnif. selectionesque Urbis Ven. prospectus*, 22 pl., fol., Ven., 1741; 1751. ZUCCHINI, *Nuova Cronica Veneta, descr. di tutte le pubbliche architetture*, 2 vols., pl., 8vo., Ven., 1784-5. QUADRI, *Il canal Grande di Ven. descritta*, 47 pl., fol., Ven., 1828. DIEDO, *Le Fab. più cospicue di Ven.*, fol., Ven., 1815; 1820. CICOGNARA, DIEDO, AND SELVA, *Fabbriche e i Mont. cospicui di Ven.*, pl., 1838-40. VALLARDI, *Edifices of Venice*, 4to., 1820. SELVATICO, *Architettura e Scultura*, 8vo., 1847. PRICE, *Exteriors and Interiors*, fol., 1843. ANTONELLI, *Collezione dei Migliori Ornamenti Antichi — con alcune frammenti di Gotica archit.*, 110 pl., fol., 1831; 1843-46. ROUARGUE, *Venise, ses principaux Mons.*, fol., 1832. FONTANA, *Venezia Mont. pittoresca, il palazzi*, fol., Ven. (1850). RUSKIN, *Stones of Venice*, 4to., 1851; *Examples of the Architecture*, 15 ill., fol., 1851. WARING AND MACQUOID, *Architectural Art*, fol., 1850. ROSENGARTEN, *Architecture of Venice*, in ALLGEMEINE BAUZEITUNG, 1849, pl. 236-43. WEBB, *Continental Ecclesiology*, 8vo., 1848. SEDDON, *The Monuments of Venice*, in B. J., 1852, x, 276, 310. STREET, *On the Photos of Venice*, in B. J., 1859, xvii, 146, 170. GODWIN, *Going Along*, in B. J., 1863, xxi, 837, 853. *Ricordo di Ven.*, photos, fol., Ven., 1884. BLASHILL, *Italy for Students*, in B. J., 1885, xlix, 675-7. STREET, *Brick and Marble Architecture*, 8vo., 1855; 2nd edit., 1874. E. GEORGE, *Etchings of Venice*, 1887. A plate of four capitals and two well curbs, in B. J., 1888, lv, 304. ANDERSON, *Arch. Studies in Italy*, 6 pl., fol., 1888-9.

BARBARO, *Viaggi fatti da Ven. alla Tana*, 8vo., Ven., 1543-5. FOUCASSÉS, *General History of Ven.*, fol., 1612. SANSONO, *Venetia città nobilissima*, 4to., Ven., 1604; 1663. KIEV, *Venezia Mont. Pittor.*, fol., Ven., n.d. SANDI, *Venezia*, 6 vols., 4to., 1755-56. The Town Council, *Venezia e le sue Lagune*, pl., 3 vols., 8vo., Ven., 1847. A list of books is given in B. J., 1879, xxxviii, 529.

ARCH. PUB. SOC.

Portraits de tous les Princes et Ducs de Venise, 90 pl., fol., 1614. CRISTIANO, *Il forestiere illuminato intorno le cose più rare*, 8vo., 1715; 1740; 1765. BOSCHINI, *Descr. di tutte le pubbliche Pitture di V.*, 16mo., Ven., 1733, and other books on the pictures. ZANETTI, *Della Pitt. Ven. e della opere pubbliche di Ven. maestri*, 8vo., 1771. ENGELBRECHT, *Ninety-two Views*, 4to., Augsburg, n.d. CICOGNARA, *Storia della Scultura*, fol., Ven., 1813. PERKINS, *Italian Sculptors*, 4to., 1869. CICOGNARA, *Iscrizioni Veneziane*, 4to., Ven., 1824-28. BATTAGLINI, *Dissert. Storico delle Acad. Ven.*, 1826. *Statuti dell' Acad.*, 4to., Ven., 1782. ZANOTTO, *Pinacoteca della Imp. Reg. Acad. Ven. delle belle arti*, 100 pl., 2 vols., fol., Ven., 1832-34. LUSH, *Venice and her Arts*, in CIVIL ENGINEER, ETC., *Journal*, 1847, x, 342, 373. *Arab Gleanings in Venice*, in ATHENÆUM *Journal*, 1847, Sept. 25. YRIARTE, *Venise, Histoire, Art, etc.*, fol., Paris, 1878; transl. by Sitwell, fol., 1880. MOLINIER, *Venise, Ses arts décoratifs, ses musées, etc.*, Paris, 1889. 12. 14 15 26 28 50 96.

VENEZIA (ARDUIN DA), or ARDUINUS TAIA, perhaps in error for ARDUINUS TAPIETRA, 1340 at Venice.

VENEZIA (BERNARDO DA), is towards the end of 1391 described as "magister et intaleator lignaminis"; he was called to Milan to decide on plans at the same time as E. Gamodia. The *Handbook* (1878) attributes to him the design of the celebrated certosa at Pavia: he was succeeded by G. Solari. GIULINI, *Memorie*, 4to., Milan, 1760-70, xi, 445, 450, 457. FRANCHETTI, *Duomo*, fol., Milan, 1821, p. 140. MAGAZINE OF ART, 4to., 1883, p. 443.

VENEZIA (GIACOMELLO DA), 23 July 1399 was employed at Milan. GIULINI, *Memorie*, 4to., Milan, 1760-70, xi, 456. FRANCHETTI, *Duomo*, fol., Milan, 1821, p. 141.

VENEZIA (PIETRO PAOLO DA), perhaps the same as P. P. Celega (delle MASEGNE), "artefice di gran credito", in 1366 designed the cathedral at Udine. MANIAGO, *Guida d'Udine*, 8vo., San Vito, 1840, p. 26.

VENICE; see VENEZIA, in Northern Italy.

VENTITIENNE. A pavement so called in 1821, being a stucco highly polished like marble. VENETIAN PAVING.

VENNEKOOL (JACOB), 1661-4, designed the *stadthuis* or town hall, formerly the admiralty, at Amsterdam; and constructed several other buildings in that city and elsewhere. 24.

VENNES (. . .), at Geneva, 1707-12 constructed the *hôpital général*; also the *hôtel de ville*; and designed the temple de la Fusterie, or Temple neuf, inaugurated in 1715: DUSSEUX, *Les Art. Franç.*, p. 42. LANCE, *Dict. Archit.*

VENT. "A pipe of lead or potters' ware, one end of which opens into a cell of a necessary house, the other reaching to the roof, for the conveyance of the fetid air"; also "an aperture made in those walls that sustain a terrace to furnish air and to give passage for the waters"; 1736. The FLUE or funnel of a fireplace is so called in Scotland. SMOKE VENT, in early mediæval work. 4.

VENTA BELGARUM. The old name of WINCHESTER in Hampshire.

VENTER of an aqueduct. VITRUVIUS, viii, 7, directs that when waterpipes cross a valley, a subterranean reservoir, or venter, should be formed wherein the water may be collected and its expansion diminished so as not to burst the joints of the pipe; and open vertical pipes be raised therefrom for the escape of air in the water. AIR ESCAPE. 1.

VENTERIUM. A Latin term for the top story of a house; SHIPLEY, *Glossary*, 8vo., London, 1872.

VENTES. "Feet of ventres crest and ventres pro entaylment"; i.e., openings in a battlement, commonly called crenel embrasures or loop; WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., 1886, iii, 621.

VENTIDUCT. A subterranean passage, chiefly made in Italy and other warm countries, where fresh and cool winds, being kept, are made to communicate by means of funnels or other ducts, with the other apartments of a house, to keep them cool in hot weather; 1736. 4.

VENTILABRUM. A Latin term for a banner; or a van or fan, for winnowing corn. SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837. SHIPLEY, *Glossary*, 8vo., 1872.

VENTILATION. Many volumes have been published on the subject of ventilation, and innumerable patents have been granted for apparatus to effect ventilation; and still one of the evils most common, both in public and private buildings, is insufficient ventilation. All rooms, great or small, ought to be ventilated. In sanitary science in house construction the moderns have perhaps made little progress; in some respects "advanced backwards"; that is, the perfection of workmanship and of materials in modern houses is an evil. Floor-boards are stove-dried, close-jointed, and laid double; skirtings are of cement; door-casings, window-casings, and doors and windows are "the perfection of workmanship". The entire house, from basement to roof, is sound and air-tight in walls, in floors, in doors and windows, and in roof; but arrangements for ventilation there are none, and herein consists the evil. The openings from the grates to the flues are low; the ceilings are high; but a never-ceasing change of the internal atmosphere is seldom provided. The costly material and perfection of workmanship is spoiled in house building, because no provision is made for permanent ventilation. Better for health, the apartments of our great-grandfathers, with a wide chimney, with its fire on the hearth, and with chinks, cracks, and openings in floor, walls, doors, windows, and roofs, letting in fresh air. Our great-grandfathers may have shortened their lives by gluttony and strong ale; they may have suffered from rheumatism; but they did not die prematurely; *BUILDER Journal*, January 1867.

Air is an elastic substance; heat expands it, causing it to occupy more space, and hence it is lighter in proportion to the heat imparted to it. Cold air being heavier descends, and when the air in a room is several degrees of heat above the external atmosphere, this colder and heavier atmosphere presses in to restore the balance, through every chink and opening, causing the cold, so-called draughts. Ventilation free and abundant, should in all cases be provided, for the inlets are readily more or less closed as occasion may require. All persons, gentlefolks and artisans, prefer a stagnant atmosphere to any supply of fresh air which comes in the shape of a cold blast. Then comes in use the "draught and dust excluder". There is always a current of air through key-holes and window-crevices, because the external air being colder than the air in the room occupied, rushes through the crevices to supply the deficiency caused by the escape of warm air up the chimney. If the lower sash of a window be opened, there is more draught than if the upper sash be opened; if the lower sash be opened, cold air will rush into the room and cause a draught inward; but if the upper sash be also opened, the heated air rushes out, and of course there will be less draught inward; a room is best ventilated by opening the upper sash. The hottest place in a public building is the gallery, because the heated air ascends, and the cold air which can enter through doors and windows keeps down till it has become heated.

No amount of ventilation will do away with the evils of overcrowding. The rarefaction of gases by increase of temperature has an important bearing upon the science of ventilation; for in rooms wherein the source of heat is situated at a low level, the outlet for the vitiated air would be most advantageously placed in the upper part of the room. But as in cold confined rooms there is a marked tendency in the heavier gases (in foul air, in fact) to accumulate in the lower strata, every effort should be directed to cause the supply of fresh pure air to pass from above downwards. In headings of mines, or in positions where heated gases are likely to accumulate, the foulest air will be found in the upper strata; in sewers and cesspools the most repulsive gases will be found also in the upper strata, but the most fatal ones occur at a lower level. It is calculated that human beings on the average inhale in a minute a volume of air equal to 320 cubic ins., and

that they evolve 25 cubic ins. of carbonic acid; the oxygen consumed by a candle is said to be 16.6 cubic ins., and the carbonic acid produced is equal to 4.2 cubic ins. A man working in a mine is supposed to give out enough heat to raise 34,000 cubic ft. of air 1° of Fahr. in an hour; and a candle will raise 26,000 cubic ft. in the same proportion; under these conditions it is calculated that, in order to prevent the air of a mine from becoming foul, a supply of fresh air equal to about 100 cubic ft. per minute, and per individual, ought to be introduced; and it may be proper to adopt the same proportion for the ventilation of private buildings. A horse is said to require a supply of fresh air equal to 340 ft. per minute. Provision should be made for generating and preserving artificial heat as will keep the room at a settled temperature, say of from 60° to 65°. The quantity of fresh air admitted must be as great at one season of the year as another. Vitiated air on being emitted from the mouth has a temperature between 80° and 90°. The *Report of the Board of Health to Parliament on Quarantine in 1857*, establishes that to ill-ventilated dwellings is attributable the epidemic influence of febrile disorders, whether described as cholera, influenza, typhus or otherwise, and that the inlet of fresh air, is, with cleanliness, the requisite and efficient corrective; *Rationale of Pestilence* by CHAMBERS'S EDINBURGH JOURNAL, p. 136, on Arnott's report on Croydon drainage (after 1843).

The following paragraphs record some of the ready methods for obtaining fresh air and removing vitiated air from a room.

To take off vitiated air; an aperture 12 ins. in the ceiling over a gas burner; a metal funnel having a perforated cover put to it, the smaller end joined to a 4 in. tube carried to the outside and let into a box 3 ft. long and 6 ins. square, the two ends covered with very fine wire gauze; *B. J.*, 1866, xxiv, 121, by G. Wheeler.

Several air pipes 6 ins. wide in the ceiling; three holes 1 in. wide bored in the lower part of the window-frame, and three holes ½ in. wide in the upper part; numerous small holes bored in the bottom of the door; MacKinnell's patent, *BUILDER Journal*, 1860, xviii, 404. T. BANKES, *Universal Geography*, fol., London (1790?), states it was used for ventilating cellars of houses two-and-a-half centuries ago.

Horizontal zinc tubes 3 ins. diameter, perforated at the sides; by sir John Walsham, for workhouses, factories, etc.; *ARCHITECT Journal*, 1850, ii, 524. Tubes in ceiling and valves; *B. J.*, 1860, xviii, 77, 710, 726.

Ventilating chimney-shaft gradually widening from the base to the summit; an arrangement of widening diameters adopted throughout the system at the Manchester Free Library; *B. J.*, 1852, x, 579.

An upright shaft or pipe; when the wind blows over it a diminution of the pressure of the column of air therein is caused, and so produces an upward current. The admission of cold fresh air must be guided so as to give it an upward current, so that it might be spent before it reached the lower portion of the room.

A length of stuff 3 or 4 ins. high, placed between the frames on the sill, for the lower sash to shut upon, thus admitting fresh air at the meeting-bar; this length of wood should be covered with baize so that when the sash is shut down there shall be no current of air around it to annoy those sitting near it. Another method is to fix a bar between the beads and on the bottom bead; but then air comes in between this bar and the sash.

Ventilating quarry of lead (uncommon), xv cent., from Havers-holme priory, Lincolnshire; *ARCHÆOLOGICAL Journal*, 1856, xiii, 105. Another, still in place, at the old buildings, the Porta at Ely.

The new method of ventilation, in which the openings for the ingress of fresh warmed air and the egress of foul air are both near the floor, is said to have effected wonders, and never yet to have failed; *ENGINEER Journal*, 1867, May 10, p. 411; and CHAMBERS'S JOURNAL. This was tried at an almshouse at Philadelphia; the heated air is brought in where the fireplace

is usually placed, and near it are two other openings connected with a flue as the outlet tubes. The fresh warm air rises in the apartment, and forcing the cold and vitiated air down it is thus drawn off. B. J., 1863, xxi, 810, as to lower part of room.

JEBB, *On Construction of Prisons and Ventilation*, 4to., 1844; explains his system of ventilating prison-cells, which is successful; warmed air being admitted at the top, and foul air drawn out at the bottom of the opposite wall, by the aid of a furnace in an upcast shaft, as mines are ventilated.

Good examples of edifices ventilated are mentioned B. J., 1858, xvi, 715. ALHAMBRA. BARRACK. CELLAR. HOSPITAL. MONKEY-HOUSE. TROPICAL CLIMATE.

AERO-DYNAMICS. ANEMOMETER. AIR MACHINE. DRAUGHT. FIREPLACE. FLUE (p. 596). FORCE OF WIND. FOUL AIR. GAS (noxious). PLENUM. VACUUM.

Baillie. Brattice. Brunton. Chowne. Diaphragm or double current ventilator. Fan. Hopper casement. Kite. Mackinnell. Moore. Pump. Punkah. Tobin. Tube. Valve. Watson.

Detached Essay, Ventilation, 1850. WHITEHURST, *Vent. of Rooms*, etc., compiled by Willan, 4to., 1794. CHABANNES, *Conducting Air by forced Vent.*, 1818. STUART, *Principles of Heating and Vent. by Open Fireplaces*, 8vo., 1825. TREDGOLD, *Principles*, etc., with App. by Bramah, 1833. ARNOTT, *Treatise*, 1838. AINGER, *Vent. and Warming*, 1835. INMAN, *On Ventilation*, etc., 8vo., 1836. BERNHARDT, *Warming and Airing Buildings*, 8vo., 1835. HOOD, *Warm. and Vent.*, 1844. *Papers of Corps of Royal Engineers*, 4to., 1841-48, vi. BERNAN, *History of W. and Vent.*, 8vo., 1846. WALKER, *Useful Hints*, 1850. RICHARDSON, *Treatise*, 2nd edit., 1839. BURN, *Practical Vent.*, 1850. TOMLINSON, *Warm. and Vent.*, 12mo. (Weale), 1850. DOWNING, *Country Houses*, 8vo., New York, 1850, p. 461-84, describes American systems of that period. WATSON, *Thermal Vent.*, 8vo., New York, 1851. LLOYD, *Warming, Vent., and Humidity of Rooms*, 1854. Dr. B. JONES, *Ventilation*, at Royal Institution, ATHENÆUM, 1856, p. 524. REDD, *Ventilation of American Dwellings*, etc., 8vo., 1858. URE, *On Vent.*, in *Dict. of Arts and Manufactures*, 8vo., 1860. *On Ventilation*, B. J., 1860, xviii, 77; which 1858, xvi, gives some lines from an American source on fresh air; also 1862, xx, 203. RITCHIE, *Treatise on Vent., Nat. and Artif.*, 8vo., 1862. MORIN, *Etudes sur la Vent.*, 8vo., Paris, 1863. ROBERTON, *Laws of Nature's Ventilation, and their application in Construction*, at Manchester Statistical Society, in *BUILDER Journal*, 1862, xx, 513. EDWARD SMITH, *On Ventilation*, *SOCIETY OF ARTS Journal*, Feb. 1869. GRISCOM, *Uses and Abuses of Air*, New York, 1870 (?). EASSIE, *Healthy Homes*, 8vo., 1872. DRYSDALE and HAYWARD, *Vent. with Warm Air*, 8vo., 1873. T. C. HINE, *Warming and Vent.*, in *BRITISH ARCHITECT Journal*, 1874, p. 344: *Vent. as applied to Buildings*, *idem*, 1889, June, p. 437, 455. BOSC, *Tratité complet théorique, etc., de Chauffage et de la Vent. des Habitations*, etc., 8vo., Paris, 1875. PARKES, *Manual of Hygiene*, 5th edit., 8vo., 1878, p. 140. ROBINS, *Heating and Ventilation necessary for Applied Science Instruction Building*, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1883-84, p. 25, with a table. CORFIELD, *Laws of Health*, 12mo., 5th edit., 1887.

VENTILATOR. A machine made to turn with the wind and placed in a wall or on a roof in order to throw a due quantity of fresh air into a close apartment. *On the Inventions in* 1862, B. J., 1862, xx, 731. VENTILATION.

VENTILOGIUM. A Latin term for a VANE. SHIPLEY, *Glossary*, 8vo., 1872.

VENTIMIGLIA (Anc. Albium Intemelium). The former capital of the Ligurian Intemelii, in Piedmont, Northern Italy, situated on the Mediterranean at the mouth of the river Roya. It has modern walls and two forts. It is the see of a bishop. The duomo dedicated to the assumption of the Virgin (is modern?), a rude and singular Gothic peculiar to the Riviera, not yet studied; the interior has been much modernised. The church of S. Michele arcangelo, romanesque; restored 1842 (? now cathedral), has a good crypt: two Roman milestones

temp. Augustus and Antoninus pius are preserved therein. A court of justice and other edifices. GR. ROSSI, *Ventimiglia*, 8vo., Turin, 1859. 28. 50. 96.

VENTURA (JOHANN), built 1555 the palace of the *burg-graf* in the schloss at Prag. 68.

VENTURA da Bologna; also a sculptor; 1220, carved for bishop Enrico della Fratta, the "marble lions and figures" to the south portal of the cathedral of S. Pietro in Bologna. The ancient bénitiers stand on them. 30. 105.

VENTURI (SERGIO), with C. Maderno enlarged the present palazzo Rospigliosi upon the piazza del Quirinale, for cardinal Mazarin (1641-61). It was commenced 1603 for Scipio Borghese by F. Ponzio, and continued by G. Vasanzio; being called Altamps, Bentivoglio, and Mazarin, in succession. LETAHOULLY, *Rome Moderne*, 4to., Paris, 1840, pl. 328, p. 673.

VENTURINO MARBLE is red and white.

VENTUROLI (ANGELO), born 1749 in Medicina in duchy of Bologna. He studied under G. A. Bettini and P. Fancelli. At Bologna, he designed the campanile to the church of S. Sigismondo (by C. F. Dotti); added portico to the palazzo della dogana, later pal. Mattei; after 1779 restored the church of S. Gregorio; 1780 rebuilt the church of Sta. Maria Labarum Celi or la Baroncella; the capella Marsigli Rossi Lombardi, in S. Petronio; and 1778-81 the church of S. Giuliano; *cir.* 1780 restored the pal. Ercolani (the gallery around the staircase is by C. Bianconi; *Illustrations*, Staircase, pl. 38); the altar to SS. Vitale ed Agricola in the crypt of S. Stefano; designed the high altar in Sta. Maria della Vita; 1814 restored the cappella Santissimo in S. Petronio, for marchese A. Malvezzi Campeggi; added the portico to the pal. Pietramellara, now Rusconi; 1815 high altar in Madonna di S. Luca; staircase in the sala in the certosa or cimiterio comunale in the former monastery de' Cappuccini; 1819 restored S. Paolo for the Barnabite monks (designed 1611 by G. A. Magenta); the church della Madonna della Consolazione, near S. Stefano; and the collegio Poeti (built 1774); designed the *casa* Rinieri facing the bishop's palace; and a *casa* at the beginning of the via Canton de' Fiori now formed for the extension of the via Medesima. The church at Baragazza, Castel Guelfo, and Poggio Renatico. A pal. at Calcara, at Manzolino, Medicina, Borgo, Rigosa di Zola, and a villa at Castel Franco, near Treviso, for cardinal Cunaro. He died in 1820, leaving property to found a college for architecture (1825) now in the Hungarian college (by G. and G. A. Torri, completed 1700 by G. A. Conti). He was buried in the cemetery at Bologna. AMORINI, *Vita di Vent.*, 8vo., 1827. MILIZIA, *Opere*, 8vo., Bologna, 1827, v, 481. MASINI, *Bologna, dell' Arte*, etc., 8vo., 1862. 28. 105.

VENUS; TEMPLE TO. The Roman name for the Gr. Aphrodite, the goddess of beauty, mother of love. She is represented with a pretty face, a graceful attitude, as in numerous fine statues; her attendants are nymphs and graces. Temples were erected to her in every kingdom. On the island of Cerigo, ancient Cythera, are the remains of one of the oldest temples to Aphrodite, mentioned by Homer, Herodotus, and Pausanias, it was discovered by Dr. Schliemann, Dec. 1887. At Rome, to Venus genitrix, erected on a piece of ground next the old market-place by Julius Cæsar (died B.C. 44), at a cost of a million of sesterces (so many francs); who also added Venus Victrix, or by Pompey (died B.C. 48), on the summit of the *carca* of his theatre. Palladio measured it as late as XVI century; parts of its wall are in the yard of No. 18 Vicolo del Ghettairello; *BUILDER Journal*, 1864, xxii, 925. Hadrian (117-138) designed a grand temple to Venus and Rome. At Chuse or Cuse, now el Qousieh, in Egypt, a Roman town north of Thebes, is a small monolithic chapel of black marble, probably to Venus Uranim; *DESCRIPTION DE L'EGYPT*, iv, pl. 67. Venus and Adonis at Amathus, now Limasol, celebrated, but no remains. At Carthage, the sacred precincts of the temple formed a circumference of two miles, was converted into a Christian church, A.D. 387. Near San Giuliano in Sicily, on

Mons Eryx, are the ruins of the once magnificent temple to Venus, whose splendours are spoken of by Polybius, Virgil, Diodorus Siculus, and others; there are chambers under it. The temples near Paulitza, Sparta, Tegea, and Symmachia at Mantinea, are noticed in BLOUET, *Morée*, fol., Paris, 1831-38. Venus Stratonice at Aphrodisias, converted into a basilica (TEXIER, *Asie Mineure*, fol., Paris, 1839). To the Paphian Venus, at Tegea, the work of Chiriosophus of Crete, B.C. cir. 500 (PAUSANIAS, *Descr. Gr.*, viii, 41). In Cyprus, to Aphrodite at Palæo-Paphos, excavated by the British School at Athens (*Times* newspaper 1888; ROY. INST. OF BRIT. ARCHITECTS, *Journal*, 28 Sept., p. 231; and 5 Dec. 1889, p. 70); also the great temple to Venus at Kouklia, 221 ft. by 167 ft., as stated by Cesnola (T'ANSON, *Island of Cyprus*, R.I.B.A., *Sessional Papers*, 1882-83, p. 16). The temple in Cyprus was a model of the temple to Venus at Ascalon, plundered by the Scythians; HOMER, 105. LAJARD, *Le Culte, les Symboles, les Attributs, etc. de Venus en Orient et en Occident*, 4to., only 35 pl. published, fol., atlas, Paris, 1837-49. 6. 14. 59.

VERACI (PAOLO), of Florence, where he 1834 rebuilt the casa Balzani; and designed 1835-8 the mattatoi or pubblici macelli (abattoir). FANTOZZI, *Nuova Guida di Firenze*, 8vo., Fir., 1842, p. 554, 712.

VERA CRUZ or Villa Rica de la Vera Cruz (It. Vera Crux). A seaport city on the gulf of Mexico. It was founded in the latter part of the XVI century on the spot where Cortez first landed, and obtained the rank of a city in 1615. It is defended by the strong castle of S. Juan de Ulloa, and has a fine light-house costing 600,000 francs. A view of the great square is given in NEBEL, *Voyage du Mexique*, fol., Paris, 1836. The houses are built of coral limestone, sometimes three stories high, flat-roofed, by which water is obtained and stored in the tanks (*algibes*) for two or three years' consumption. Of the sixteen churches only six are used; the domes form conspicuous objects. There are several dilapidated monasteries. The port of Tampico together with the unhealthiness of the climate have tended to reduce the population from 20,000 to under 7,000. 14. 50.

VERADAVATI, "city of warriors"; now Burpotra, "leaf of the bur", corrupted into BARODA, in Guzerat.

VERANDAH. Feerandah, Mirandah, Viranda. A light external open gallery, or covered way, with a sloping or lean-to roof. This cover (Fr. *campane*) has an APRON as a cornice (Fr. *houppes*) sometimes *en forme de clochette*. It was introduced into Europe from the East towards the end of XVIII cent. On the front and back of the house of Jacques Cœur at Bourges 1443-53 is a covered balcony which could not apparently be used; GAILHABAUD, *Monuments*, 4to., 1842-52, iii. The term has been given to an enclosure to a window projecting all round being carried by a balcony (cut from Sans Souci in ARCHITECT *Journal*, 1850, ii, 543). ARUNDALE, *Examples of Verandahs*, 24 engr., 4to., Lond., 1851. VAUX, *Villas and Cottages*, 8vo., New York, 1857, p. 99. 14.

VERARDI (GIUSEPPE ANTONIO), of Bologna, executed well the church of Sta. Maria Labarum Cœli or la Baroncella (1780 by A. Venturoli); and designed the campanile to it; also 1775 the casa Berti. He died 1817. 105.

VERCELLI and Vercell (Anc. Vercellæ). A town in northern Italy, situated on the river Sesia, over which is a closed bridge of iron plates. The fortifications were destroyed 1704. It is the see of an archbishop. The basilica Romana or duomo, dedicated to S. Eusebio, cir. 1550, attributed to P. Tibaldi, is in a good Italian style; the cupola is modern. The damage done during the French wars has been repaired, and the tomb 1677 of S. Amadeus of Savoy (died 1472) redecored 1823 by S. Savesi, an artist of Turin; the woodwork of the choir 1822 from the designs of Ranza, a native; the curious bold portico was designed (before 1767) by B. I. di Alfieri. The church of S. Andrea was founded 1219 by cardinal Wala or Guala Jacopo Bicchieri (died 1227), papal legate in England temp. king John

and Henry III. The design has been attributed to "Tomasso Gallo", a French ecclesiastic afterwards the first abbot (died 1246, his tomb exists); but OSTEN, pl. 7, gives Briginthe as the author 1219-22 who used the round arch in the façade and at the time the pointed arch was being used in England, as at Salisbury cathedral. The interior is of brick, early pointed arches and stone dressings. The square east end is an English peculiarity, while the polygonal chapels to the transepts is more French and is a distinctive feature of the Cistercian churches of that country. The square detached campanile was added 1399 by Pietro del Verme (query priest or donor). Among the other nine churches are: S. Bernardino with curious Lombard work; Sta. Maria Maggiore, old, with marble pillars and a mosaic pavement representing the history of Judith; Sta. Catarina; and S. Cristoforo of the Umiliati and later the Jesuits, with good paintings 1532 by G. Ferrari. Some good monastic buildings and nunneries. There are also a large hospital with a good cloister, founded by cardinal Guala, which has a crypt-like chapel under the principal ward; a royal college; a castle now the courts of justice; town house or residence of the governor, the casa Mariano having a fine hall used as a granary; extensive cavalry barracks and good theatre. The statue of count Cavour was erected 1864. The gate leading to Milan is of good architecture. VALÉRY, *Voyages en Italie*, 2nd edit., 8vo., Paris, 1833; transl. by Clifton, 8vo., Paris, 1842. GALLY KNIGHT, *Eccles. Architecture*, fol., 1842-44, ii. OSTEN, *Bauwerke*, fol., Dams., 1846, pl. 7, etc. GRUNER, *Ornamental Art*, fol., 1850, pl. 44-6, paintings of XIV cent. BUILDER *Journal*, 1857, xv, 126-7; WEBB, *Cont. Ecclesiology*, 8vo., 1848, p. 403. FREEMAN, *Historical Sketches*, 8vo., 1876. FERCUSSON, *History of Arch.*, 8vo., 1865-67. 14. 28. 50. 96.

VERCHOK. A Russian measure of length. ARSCHINE.

VERDE ANTICO (Ital.); (*verd antique*; Fr. *vert antique*), or Ophiolyte. A clouded green marble is serpentine combined with magnesia or carbonate of lime. A beautiful dark green marble, with spots of brighter green, pure white and fine black; the colours should be well marked; and if the green be of a greyish cast, the marble is not so valuable. Sometimes the edges of the spots are tinged with green. This superb material came from Thessalonica and Laconia. This last ancient quarry was re-discovered on the north coast of the island of Tinos, in Greece, by the German sculptor Siegel of Athens (ATHENÆUM *Journal*, 1853, p. 1596. ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 19 March 1860; as exhibited there by Kleanthez the proprietor, B. J., 1860, xviii, 262). It was used as an ornament in ancient buildings, and in the famous luxurious baths of Corinth. In the cathedral at Lucera are thirteen columns of this marble found under the edifice and supposed to have belonged to a temple to Apollo; another column was discovered later. The Vermont verde antique of America is said to have no lime and is harder and more compact than the European; BURNHAM, *Limestones*, 8vo., Boston, U.S.A., 1883, p. 8, 49. A similar stone occurring in France is called *melaphyre*. 25.

VERDE DI EGITTO; vert d'Egypte; vert de mer, verde di mare; a verd moderne marble, all varieties of the verde antico; and also called POLZEVEVA di Genoa, occurring there and in Tuscany, and much valued for its beauty. A quarry on the Kossayn road is only occasionally employed for ornamental purposes; WILKINSON, *Ancient Architecture*, 8vo., 1850, p. 96. BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 349. BRINDLEY, *Ancient Quarries of Egypt*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1887-88, p. 17-24. BLONDEL, *Cours*, 8vo., Paris, 1777, v, 163, mentions four Ionic columns of verd de mer in the church of the Carmelites in the faubourg S. Jacques at Paris; chimney-pieces in the old château de Meudon, etc., as in D'AVILER, *Vignole*, 8vo., Paris, 1696, in *Termes*, s. v. Marbre, p. 155. EGYPTIAN GREEN MARBLE. GREEN MARBLE. SEA GREEN. BRECCIA. *Vert des Alpes*; and *vert des Morins* are other varieties. The *verde di Corsica*, or verde antico di Orezza, is a variety of verte Euphotide, found in the torrent de la

Cavagna, opposite La Rochetta; another at Voltri, near Genoa. It has been much used in Italy, as in fine plaques in the chapel of S. Lorenzo at Florence; BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 260. It contains euphotide, diallage, and often sunaglite, a combination which forms the *gabbro* of VON COTTA. The *verde di Peglia*, near Genoa, is a serpentine breccia cemented by a light green calc spar. The *verde di Prato*, is a dark green serpentine from the hills of Monteferrato, extensively used as a blackish marble for decorations in the cathedral and baptistery at Florence; the front of church of S. Paolo at Pistoia; at Pisa, and elsewhere. The *verde di Pagliocco* is a straw-green breccia with greenish and yellow spots. The *verde Sanguineo Antico* is a greenish grey breccia with white, red, and black spots. The *verd Campan*, the quarries of which are near Tarbes in Gascogne, afford the fine examples of eight Ionic columns at the château de Trianon in the court; BLONDEL, *Cours*, 8vo., Paris, 1777, v, 163; CAMPAN MARBLE.

VERDEN, Ferden, Verda and Werda (Anc. Tulipurdum). A town in the duchy of the same name in Hanover, situated on the river Aller, over which is a bridge. It was formerly the capital of an episcopal principality, is still walled, has three gates, and was 786 or about 807 created the see of a bishop. The former cathedral, dedicated to S. . . . is one of the best ecclesiastical edifices in Hanover; the choir and transepts date 1291-1390, the nave 1473-90; it is built partly of moulded brick and of stone: it is 274 ft. long, and without a tower; the bishop's throne dates XIV cent. In the church of S. Andrew is a brass to the bishop Yso von Wilpe, died 1231, the earliest one known in Germany or England; it is given in GREENY, *Foreign Brasses*, fol., 1884. There is a town hall. 14. 28. 50. 96.

VERDI KHAN (ALI or ALLA). Architect of the palace called the Tehaharbagh, and of the bridge over the Zendheroud at Isfahan, for Shah Abbas 1629-42. His portrait is given in TEXIER, *Arménie*, fol., Paris, 1852, i, pl. 74; ii, 123-4; 130. This bridge, also called *julfa* or *djulfah*, is described in CHARDIN, by LANGLES, *Voyages en Perse*, 8vo., Paris, viii, 1811, p. 30, pl. 43, 44, and 47; LEBRUN, *Voyage par la Moscovie*, etc., fol., Amst., 1718, i, 201, pl. 77-8; *Aliverdichan* of GAUTHY, *Construction des Ponts*, 4to., Paris, 1809-10, i, 51, pl. 5, fig. 77. FLANDIN, *Perse Moderne*, fol., Paris, 1844-51, pl. 46.

VERDIGRIS, vertdegris, and verdigraze; acetate of copper, a beautiful green colour, prepared by laying plates of copper in beds with the husks of pressed grapes and then scraping off the rust, which gives a bluish green; mixed with a little yellow pink, a fine grass green is obtained. It is used as a colour in oil and water. Copper acted upon by the atmosphere obtains a coat of the hydrated carbonate of that metal. The term VERUGO is given to the coat which bronze acquires from age. HYDROGEN. The Rhodian method of making verdigraze is related by VITRUVIUS, vii, xii, and xiii.

Burnt verdigris is an olive-coloured oxide of copper deprived of acid. It dries well in oil, and is more durable, and in other respects an improved and more eligible pigment than in its original state. URE, *Dict. of Arts*, etc., 8vo., 1875.

VERDITER. A carbonate of copper; lime decomposed with a solution of nitrate of copper; or procured out of verdigris; both blue and green, sometimes sandy in colour; chiefly used in house-painting. BLUE VERDITER or BLUE RICE. CENDRES BLEU. Green verditer (*verde di terra*) is the same as *terra verde*, is a native green carbonate of copper. Bremen green is copper subjected to sea salt and vitriol for three months. 7. 9. 14.

VERDUN (Anc. Verodunum). A town in the department of the Meuse, in France, situated on the river Meuse, over the five branches of which there are numerous bridges. It is walled, having bastions; four gates, one being a good example of xv cent., and a citadel on the site of the old abbey of S. Vannes, x cent., part of the buildings being used as barracks. It is the see of a bishop. The cathedral dedicated to the Virgin, has portions of x cent. work; a crypt of xi cent.; it was burnt 1047; rebuilt 1140 by . . . Garin, and was re-

ARCH. PUB. SOC.

consecrated 1147. There are five other churches, a protestant church, and a synagogue; a large ex-episcopal palace; a large seminary designed 1825-30 by J. T. Oudet; cavalry barracks; theatre; town hall xvii cent. with a large library and museum; and law courts; and a statue to general Chevert. FORBES, *Letters from France*, 8vo., 1806. 14. 28. 50. 68. 96. 110.

VERDUN (JEAN DU), clerk of the works and buildings to Catherine de Medicis, as at the Tuileries and Louvre, etc., at Paris; "greffier du jurez maçons, charpentiers et prudhommes de cette ville". He died 19 Oct. 1588, aged 77. Tomb in the cemetery of Saints-Innocent, at Paris. LANCE, *Dict. Biog.*, 1872.

VERELST (CHARLES), previously Reed, pupil of R. Abraham of London; travelled in England and visiting Birkenhead was induced to settle there and with success. He designed S. John's church, Grange lane; the manor house at Cloughton for W. Jackson, M.P.; S. Peter's church, Chorley, near Manchester (ARCHITECT *Journal*, 1849, i, 359), many buildings in Liverpool and around it, including Lytham, the Lake district, and North Wales. In 1851 he succeeded to the estates of his grandfather (some time governor of Bengal, who bought Aston in 1771), and three uncles, of Aston hall near Rotherham, when he took the name of Verelst. He promoted the Liverpool Architectural and Archaeological Society. At his death 13 December 1859, at Birkenhead, the estate succeeded to his eldest son Charles V. Verelst, a minor. He wrote *Remarks on Farm Buildings*, 1856, printed November in the LIVERPOOL MERCURY; and *BUILDER Journal*, xiv, 701. HUNTER, *South Yorkshire*, fol., 1831, ii, 165-6. *BUILDER Journal*, xvii, 846. *BUILDING NEWS Journal*, v, 1156. TWYCCROSS, *Mansions*, 4to., 1847-50, i, 59; iv, 86.

VERGARA (ANDRES DE), was employed 1586 with others at the Escorial, after Herrera. 66.

VERGARA (DIEGO DE), 1534 was stonecutter and architect on part of the cathedral at Salamanca. J. DE LA MONTANA. 66.

VERGARA (DIEGO DE), *el mayor*, of Toledo, 1557 went to Seville to examine the works at the cathedral; he was *maestro* at the cathedral of Toledo; and 1563 was *maestro mayor* of that at Malaga, which he altered from the plan of D. de Siloe, having D. de Ibarra as *aparejador*; and where 1582 he was succeeded by his son D. de Vergara *el menor*, who finished the capilla mayor, consecrated 31 August 1588; and in 1592 commenced the coro as *maestro mayor*, where he was succeeded 1598 by P. Diaz de Palacios. He (*el mozo*) was also *maestro* at that at Toledo; and 1598 completed the church of Los Agustinos Calzados at Valladolid. 66.

VERGARA (MARTIN DE), master of the works at Toledo, 1588 attended at Salamanca as to continuing the works at the cathedral. 66.

VERGARA (NICOLAS DE). A chief artist at Toledo at the accession of Philip II. He is supposed from his style to have studied at Florence or Rome. In 1542 he was chosen by the chapter of Toledo, and many windows in the cathedral were painted by him. He was engaged with Berruguete on the tomb of cardinal Ximenes at Alcala de Henares. In 1565 he designed and constructed the principal façade to the church of S. Juan de los reyes; and worked in the hospital de Afuera. In 1575 he made the model for the church of the Bernardine monks of Sto. Domingo el Antiguo. On 1 Sept. 1576 he was appointed *maestro mayor* to the cathedral at Toledo, succeeding F. Gonzales de Lara; and died in 1574. 65. 66.

VERGARA (NICOLAS DE) *el mozo*, and brother of JUAN; 1573 designed a church for the Bernardine nuns at Toledo; 1573 was appointed sculptor to the chapter of the cathedral there, and together worked after their father on the carvings and glass painting, completed 1580; having been 9 June 1587 appointed *maestro mayor*, he executed in bronze and iron the good lateral lecterns. In 1587 he directed the church de los Minims designed by A. de Covarrubias; 1590 executed a silver ark to receive the bones of Sta. Leocadia; 1592 worked at the

hospital de Afuera succeeding F. Gonzales de Lara; and 1595 designed the sagrario of the Geronimite monastery at Guadalupe, and decorated the capilla mayor of the church. In 1595 he commenced the capilla de N. S. del sagrario at Toledo cathedral (also attributed to A. de Encinas, pupil of J. B. Monegro), which was continued by Monegro, and 1616 by G. M. Theotocopuli, as Vergara died 11 December 1606. J. Gomez de Mora in 1628 favoured the continuation of Vergara's design. 65, 66, 68.

VERGARA (JUAN DE), perhaps a son of Nicolas el mayor, designed the cathedral of Sta. Fe at Bogotá, in South America, of which building he 12 March 1572 laid the first stone. 66.

VERGE. The term given to the space of land beyond the hedge, or fence, or wall. It varies in some counties; as 3 ft. in Kent and Middlesex; 3 ft. 6 ins. in Hampshire; and 4 ft. in Buckinghamshire; there called "free-bord". FENCE.

The compass about a king's court; the lord steward's jurisdiction, about 12 miles compass.

A small ornamental shaft of a pillar in Gothic architecture; *ECCLÉSIOLOGIST Journal*, 1846, v, 169. The term "virga" occurs 1292-3 in the roll of payments for the Eleanor crosses. The shaft of a classical column is termed "verge de la colonne" in early French writers as Bullant and Maucelers. 16.

A rod, wand, or sergeant's mace; hence "verger". A rod whereby a person is admitted tenant, holding it in his hand and swearing fealty to the lord of a manor; and hence called "tenant by the verge". 23.

VERGE BOARD; incorrectly BARGE BOARD, l'arge board (Ger. *stirn Brett*).

VERGELET. A soft stone, but suitable for exteriors, obtained from the best quarries of Oise, Seine et Oise, near Paris, and introduced about 1885 into the London market, as preferable to Caen stone.

VERHOEVE (C...). The stalls in the church of S. Jacob (James) in Bruges, were carved by Moenart from designs by this architect and completed 1674.

VERIFY. To check the accuracy of surveys, levels, strains, bills of quantities, or accounts, and the mutual relations of a specification with plans, elevations, and sections, forming a set of drawings. To justify bearings, and centres of machinery, by line, square, level, and plumb. Verifying should be done by a person other than the original surveyor, accountant, draughtsman, or mechanic; and with this object, a corps of verifiers is attached to the Ordnance Survey department. R. R. R.

VERKRUYS (J...) of Amsterdam, 1722-26 built the new façade to the Vrye van Brugge, or tribunal de Franc-de-Bruges, now palais de justice (the back dates 1521-23); the plan and four façades were engraved on a plate. COMMISSION ROYAL D'HISTOIRE, *Bulletins*, 8vo., 1848, xiv, 531. BRUGES. 24.

VERLY (FRANÇOIS) and Werly. He was born 1760 at Lille; 1784 gained the second grand prix. He attended to the decorations 1785 for the fêtes at Paris; designed le Colisée at Lille; the imperial tobacco factories at Bruxelles, and Amsterdam; the hôtel and houses forming the angle of the place d'armes at Ghent; a country house on the canal de Sas de Gand; the pavillon and garden at the royal palace at Laeken; interior decoration and garden at the château de Duras; restored the château de Basele; designed the new cathedral at Arras dedicated to Ste. Marie, the choir being remarkable for the slenderness of its pillars and boldness of construction: the decorations 1810 for fêtes at Antwerp, and 1816 at Bruxelles; and 1818-23 the palais de justice at Bruxelles. Before 1788 he had been appointed architect to the city of Antwerp, and in 1815 to the imperial palace; and died in 1822 at S. Saulve near Valenciennes. KRAFFT, *Art de Charpente*, fol., Paris, 1805, pt. ii, pl. 38, p. 15, gives the roof 1788 of the seminario at Antwerp, by Verly; and pl. 52, p. 19, the plans, etc., of the colisée or public recreation place at Lille, destroyed during the bombardment. His nephew CHARLES inherited his drawings. GOETREBUER, *Mons. des Pays Bas*, fol., 1827, 34, 54, 66. 110.

VERLY (LOUIS), born 7 May 1769 at Lille, was a brother. He is best known for interior decorations in oil. He designed the tobacco factory, the hôtel de ville, the église Cysoing, and many good houses, all at Lille. His son CHARLES, born 20 June 1794, assisted his father; both were living in 1831. 110.

VERME (PECHO DEL), added 1399 the campanile to the church of S. Andrea, at Vercelli. It is not clear whether he was a priest, or architect, or donor.

VERMEIL. Gilt bronze, much in fashion on the continent in 1850 for works of art. VERMILION.

VERMICULATED. Work that is chequered, continuous, embroidered in several colours; disposed in wreathed lines like the undulations of worms (*vermes*). RUSTIC WORK. QUOIN.

VERMICULATUM; OPUS. A class of Roman mosaic work usually applied to walls and vaults, as described s. v. MOSAIC WORK. The pavement in the cathedral of S. Marco at Venice, is of the same class of work, and is also called Opus Scutellum.

VERMILION and vermillion (Ital. *vermiglio*), probably from the *vermes* or insects producing carmine. A sulphuret of mercury, called CINNABAR (MINIUM) previous to its being levigated. A brilliant scarlet pigment, anciently found in a native state in Spain, and since in Mexico. It was produced artificially from near Ephesus. PLINY, N. H., xxxiii, 7. The natural product has a yellowish shade which "Chinese vermillion" has not; this last was for a long time without a rival, but has been imitated in Holland for some years. The raw materials are mercury and sulphur; the processes of manufacture are: 1, the preparation of the black sulphide of mercury; 2, its conversion into cinnabar; 3, the pounding, levigating, elutriating, drying, and sifting of the cinnabar to form vermillion. The very fine powder is dried in ovens, and this is sifted and packed for sale. Antimony vermillion is used extensively by the carriage makers in France, owing to its low price and covering powers. It has an intense red shade, and is very permanent, remaining unaffected by acid fumes; it is subject to adulterations. To retain the brilliancy of colour of pure vermillion it should not be placed in contact with metal, as it will become darkened thereby; it should therefore be used in earthen pots. It is recommended to mix with it about one-eighth of its weight of flowers of sulphur previous to mixing with the oil; *BUILDING NEWS Journal*, 1869, xvii, 176, 275. GILL, *Technological Repository*, 8vo., 1822, etc., vi, 417.

VERMILLIONETTE. A substitute for mercurial vermillion, possessing equal richness of colour and covering power; it is made pale and deep.

VERMIN. Receipts for destroying them are given in *BUILDER Journal*, 1854, xii, 270; and 1864, xxii, 120, 137. ANT. FUMIGATION. INSECT. TEREDO. TERMES. RAT. WORM.

VERMONT MARBLE. These marbles are found in New England, U.S.A. They have been classed as the Eolian, from Mount Eolus in East Dorset, Vermont, where it is largely developed; it varies in thickness from 1,000 to 3,000 ft. of white and grey marble: the Winroski: the variegated Plymouth: and the Isle La Motte. Many different varieties are found in the same quarry. The blue-grey mottled marble of Sutherland's falls, Rutland, is similar to the Italian *bardiglio*. The Brandon is generally pure white. The Winroski is a dull red in blotches. The Plymouth is a dolomite, said to weather well, a bluish grey with long white figures or stripes, and takes a good polish. The Isle La Motte is mostly black and takes a high polish; other colours, as grey, and light and dark brown. It is said to be the first marble worked in Vermont, and used at Burlington and other places; the new Congregational church of S. Johnsbury, Vermont; and the Victoria bridge on the Grand Trunk railway. BURNHAM, *Limestones and Marbles*, 8vo., Boston, U.S.A., 1883, p. 47-50.

VERNIQUET (EDME), born 9 October 1727 at Chatillon sur Seine, studied at Dijon. He designed many churches, châteaux, bridges, *usines*, etc., in Burgundy, Poitou, and Maine. In 1777 he began the rebuilding of the Benedictine priory at Marcigny

sur Loire. In 1794 he went to Paris; was appointed to the jardin du roi and designed its museum of natural history for Buffon's arrangement: also the hôtel d'Avrincourt, rue S. Dominique, and hôtel de la Queuille, rue de Babylone. 1791 he made the excellent plan of Paris, the labour of ten years. He died poor 26 November 1804 (or February 1805), aged 77, at Paris. LANCE, *Diet. des Arch. Franç.*, 1872.

VERNON (THOMAS HEYGATE), A.R.I.B.A., was born 1837 at Towcester, in Northamptonshire; educated at Totteridge Park School, and became the pupil of Messrs. Lander and Bedells of London. He assisted the late E. M. Barry, R.A., while his father, sir C. Barry, R.A., was living, and remained his chief assistant. On the sudden death of Mr. Barry in 1880, Mr. Vernon completed his unfinished works; these were Early-wood, at Bagshot; the Ralli mausoleum in Norwood cemetery; and Crewe Green schools, Cheshire, the last being for lord Crewe. He also designed on his own account the Towcester town hall; and the Agra bank chambers, Nicholas lane, London. He held the appointment of surveyor to the Cadogan and Hans place estate (limited); to the Alexandra palace and building estate company; and to the hospital for Sick Children, Great Ormond street, after the death of E. M. Barry. He died 29 July 1888.

VEROCCHIO (ANDREA DEL). See VERROCCHIO (A. DEL).

VERONA (Lat. Verone). A city of northern Italy, situated on the river Adige over which are six bridges:—1, the ponte di castel vecchio, 1354-8, of brick with three circular arches, the largest being 130 ft. span (or 161 ft.) and 40 ft. high, and two of 82 ft. and 31 ft. each beyond it; being altogether 348 ft. long; 2, ponte Garibaldi, of iron, injured 1882; 3, ponte della Pietra, of Roman construction, three arches, two being old, one pier restored by fra Giocondo 1520 or earlier (stood 1882); 4, ponte nuovo, swept away September 1882; 5, ponte delle Navie, 1373 by G. da Ferrara with G. da Gozzo, destroyed by a flood in 1757, and much shaken in September 1882; 6, ponte Alcardi, of iron, almost destroyed 1882. (A bridge 1468 of a single pointed arch 140 ft. span is attributed to fra Giocondo, with the repairs of two bridges.) The railway to Brescia is given in ALLGEMEINE BAUZEITUNG, 1855, pl. 679-81, and its two long bridges or viaducts. The Roman amphitheatre, built of Verona marble and brick under, is supposed to date between 81 and 117, being contemporary with the Coliseum (by Gaudentius, commenced 72 and first used in 80): it was damaged by Gallienus for the walls (SCHAYES, *Arch. en Belgique*, 8vo. Bruxelles, 1850, i, 202); the outer circuit also damaged 1184 by an earthquake; 1545, 1568 and 1579, care was taken for its preservation, still four arches out of seventy-two only remain; there are forty-three steps, giving 22,000 seats. The interior is nearly perfect. The major exterior axis is 505 ft. 10 ins., the arena 249 ft. 9 ins.; the lesser axis 403 ft. 2 ins., and the arena 150 ft. 4 ins. (these also stated as 513, 248, 410, and 147 ft.; also 511, 262, 404½, and 146 ft.); while the circumference is 1,470 ft. (1,429½ ft.), and the walls 100 ft. high from the original pavement. A model in cork is in the Arundel collection at Oxford. SERLIO, *Architettura*, fol., Ven., 1633, p. 144-7; MAFFEI, *Anfiteatri del Ver.*, 12mo., 1728; WOODS, *Letters. The theatre, temp. Augustus and of same period as that at Herculaneum by Numisius*; in 895 king Berengarius describes it as dilapidated; much of it was standing in XVI cent.; excavations were commenced in 1836 by A. Monga, as described by PINALI in 1845. Its diameter is 380 ft. Ver., and seated 16,000 persons. SERLIO, p. 144-5; FALKENER, *Classical Museum*, 8vo., 1851, ii, 174-200, who shows the naumachia in front and the ambulacrum behind, as restored from PALLADIO, CAROTO, and CRISTOFALLI. The *porta de' Borsari*, a double archway, dates probably from 265, temp. Gallienus, if he only faced earlier work; (SERLIO, p. 211, considering it barbarous would not give it; ANDERSON, *Arch. Studies*, fol., 1888-9. The *porta de' Leoni*, also double, of about the same age but of better art; only part remains (SERLIO, p. 206); and the *porta di Castel Vecchio* (SERLIO, p. 203). MANARA,

Porte dette dei Leoni e dei Borsari, fol., Ver., 1840. The *arco de' Gavii* which bore the name of the architect Lucius Vitruvius Cerdo, A.D. 265, the freedman of the writer Vitruvius, was 1805 pulled down by the French; (SERLIO, p. 202-3.) Other remains exist near the stables of the palazzo Miniscalchi, vaults under the stabling were used as prisons by Ezzelino da Romana; portions of walls near the pal. Sagromose; and a large number of sarcophagi.

The imperial walls, of which large masses remain, commenced by Gallienus, were succeeded by those attributed to Theodoric (cir. 500), which show alternate triplets of courses of stone and brick, the latter herring-bone; another line is attributed to Charlemagne; a fourth raised on the former by the Scaligeri who crowned them by forked or serrated battlements which with the lofty towers give the walls a peculiar aspect. The castel vecchio, now arsenal, on the river, was erected 1350-55 for Can Grande II (died 1359), its quadrangle is modernised and some fine towers demolished. Outworks were begun about 1520 by the Venetians, of which the circular bastione delle Boccare is a remarkable example, and completed with others by M. San Michele, who introduced the pentagonal and triangular system, as the bastione della Maddalena 1527: the porta di S. Martino, S. Sisto, or Stuppa; the porta S. Zenone, porta del Palio, with its inside loggia cir. 1554; the porta Orzi nuova (destroyed), and porta nuova 1533, are by him. All these were much destroyed in 1801. A fortified barrack is on the site of the castello di Pietro, which replaced the palace of Theodoric, built partly of Roman materials in a Romanesque style surrounded by porticoes; many parts were demolished for building the church of S. Pietro, now in ruins. In 1387-93 the palace was turned into a castle by Gian' Galeazzo Visconti; lost 1405 to the Venetians who added works; and blown up March 1801. The dismantled castello di S. Felice was a strong fortress by M. San Michele. The fortifications added since 1815 render it a stronghold of the first order. *Professional Papers of the Corps of Royal Engineers*, 1881, vi.

On the north side of the piazza dei Signori, or mercato vecchio, is the *palazzo del Consiglio*, formerly inhabited by the Scaligeri, lords of Verona; xv cent. probably by fra Giocondo; (died 1499) restored 1541; on their expulsion it became the seat of the municipal government; and in 1874 was restored, repainted, and fitted up for the council of the province. The external staircase in the courtyard is shown in STREET, p. 104. Details of a timber ceiling of XIV cent. in GRUNER, pl. 63. The two palaces on the south side, built 1272 for Mastino and Alberto della Scala, are modernised and now partly occupied as courts of justice and prisons. The tower 300 ft. high by Lamberti was begun 1172, and finished 1368 by the octagonal lantern for Can Signorio IX who placed in it the first clock at Verona. The piazza de' Brà now Vittorio Emanuele, is represented in a fresco by Giolifino, XIV cent., in the church of S. Bernardino, as it stood in his time. The piazza delle erbe, or vegetable market, was the forum of the republican period (KNIGHT, *Eccles. Arch.*, ii); in it is a small open tribune near the market cross; the fountain dating from 916, was restored 1368 by Can Signorio IX. The pillar set up 1524 by the Venetians, is a monolith of Verona marble having the name of Michael Leo inscribed on it (as architect), the lion was thrown over in 1797 or 1799.

The marble statue of Dante 1865 is by Zannoni of Verona. Close to the piazza dei Signori in the old cemetery of Sta. Maria l'Antica, are the fine white marble tombs of eight of the Scaligeri enclosed by iron trellice, and ranging from about 1301 to 1405. The sumptuous mausoleum of four stories of Can Signorio, erected before his death in 1375, is by Bonino di CAMPI LEONE or Campione, sculptor, as inscribed; KNIGHT, ii; STREET, p. 98-103; GAILHABAUD, *Arch. du Vme.*, coloured pl. 56: LITTA, *Famiglie Celebri Italiane*, 10 vols., fol., Milan, 1819-57, well engraved them (£60). ALLG. BAUZEITUNG, 1848, pl. 189.

It is the see founded about 806 of a bishop. The *duomo*, dedicated to Sta. Maria Matricolare, was built with the materials of a temple to Minerva; repaired 778-846; sacristy 1160; the

splendid north porch 1160; and 1187 reconsecrated. The apse without windows, and part of its sides may be remnants of the early edifice; it shows the absence of an external string-course at each level, so common a feature in Romanesque work. The south porch has two ranges of columns. No triforium. The vaulting was done 1402-1514; and in 1534 the curved Ionic colonnaded screen, the chapels along the south wall, the *torna core* of the choir, the presbytery, and alterations were by M. San Michele. It is about 225 ft. long by 97 ft. wide inside. The upper portion of the campanile by M. San Michele having failed, it was rebuilt under B. Brugnoli; *Illustrations*, pl. 52. The north cloister, formerly double, similar to that of S. Zenone, has been modernised in parts. The detached baptistery, called the church of San Giovanni in fonte 1122-35, or repaired after the earthquake of 1116; the octangular font 31 ft. circumference, almost 7 ft. diameter inside with an inner basin, is hewn out of a single block of marble; GAILHABAUD, *Arch. du Vme.*, iv, pl. 63-4. GALLY KNIGHT, ii. The west and east ends and aisle in HOPE, *Hist. Essay on Arch.*, 8vo., 1840. A doorway in *Illustrations*, pl. 120.

There are about forty churches (fifty-three in 1859) of which fifteen are parish churches, as follows:—1. *S. Giovanni in Fonte*. 2. *Sta. Anastasia* of the Dominicans: "one of the most complete and representative Pointed churches in the north of Italy" (STREET, p. 86). The main fabric 1260 to 1290, by N. da Pisa(?); the casing of the front begun 1426 is still unfinished. The nave has six arches with six aisles and a semicircular recess; and is 75 ft. wide and 300 ft. long. The stalls are behind the high altar. The width between centre and centre of the piers is seven-eighths of the half width of the nave; in Milan cathedral the former is equal to the half (WOODS). The pavement of white, grey, and red marbles is of good design and effect. Painting of XIV cent. in GRUNER, pl. 47-8. An old external door of battens forming small panels is in *Illustrations*, 1858-59, pl. 115. The font dates 1591. The sacristy is vaulted and has its own chancel. The Fregosi chapel and altar, 1565, considered by VASARI one of the finest in Italy, are by Danese Cataneo. The altar of S. Vincent is formed of the *bronzino* marble of the locality. The Pellegrini chapel has xv cent. terra-cotta bas-reliefs. Chapel of the Rosary is by M. San Michele. Capella di Jesu, early Renaissance ornament, in ANDERSON, *Arch. Studies*, fol., 1888-9. The Cavalli chapel has been chromo-lithographed by the Arundel Society. 3. *SS. Apostoli*; completed about 1194; the façade remarkable for the scroll work between the pilasters; outside are fine arched tombs. 4. *Sta. Eufemia*; 1262; of fine brick but modernised; the façade is pointed, its door dated 1436; the cloister is by M. San Michele. 5. *S. Luca*. 6. *S. Fermo maggiore*; originally Benedictine passed in XIII cent. to the Franciscans. "It affords some of the best detail of brickwork in all Italy" (STREET, p. 86, 120). The lofty crypt 1065 or earlier has massy square piers and plain vaulting; the church 1313-32 restored and part re-constructed; the pointed work may date 1313. The nave is about 50 ft. wide and is without aisles, but has chapels. The façade has not a rose window but four lancets (HOPE shows five of equal size and height). A rich round-headed doorway has mouldings passing round to the ground without interruption. The curious walnut-wood roof is rare in Italy, being a sex-foiled-headed ceiling boarded at the back of the ribs, the rafters not showing. A Gothic canopy over a good marble pulpit. The altar of the Aligeri, by F. Aligheri, of XVI cent. is also a monument. A good marble wall tomb in ROY. INST. OF BRIT. ARCHTS., *Transactions*, 1888, p. 144, pl. xxiv. The Torello Saraina chapel 1523 is good cinque-cento work. A good mausoleum of the Turriani family of xv cent.; the bronzes are now in the Louvre. 7. *S. Fermo minore* in Braida. 8. *Sta. Maria in Organa* (Olivetani); chiefly 1481, with a façade by M. San Michele; commenced by his cousin Paolo, and still incomplete (GRUNER, pl. 20). The *intarsiatura* 1499 of the choir is by fra Giovanni who also executed other works with carvings in the sacristy, which is one of the most beautiful

in Italy (VASARI); he also designed 1533 the campanile. GAILHABAUD, *Arch. du Vme.*, 4to., Paris, 1848, ii, 2 plates, and a candelabrum in iv, 5 pl., and a reading-desk in iv. 9. *SS. Nazaro e Celso* (Benedictine); partly rebuilt 1464 by (?) San Michele, but lessened, the five arches being reduced to three. The chapel of S. Biagio is Gothic. The monastery is partly destroyed. The portone dell' atrio is by A. Salette. 10. *S. Nicolo* (Theatines); 1627 by L. Pellesini; 1683 vaulted by his son V. Pellesini; the tabernacle by C. G. Guarini. 11. *S. Paolo di Campo Marzo*; by A. Pompei, but built after his death 1795. 12. *S. Stefano*; may have been the original cathedral; its interesting crypt may date from VII cent.; in it are two tombs, one supposed of Galla Placidia; the other supposed Marcian A.D. 427. The church XI cent. but much modernised. The porch resembles that at the duomo; and the central octagon tower, of the same age as that of S. Zeno, retains its original appearance. The marble pontifical seat at a high level still exists. Twenty of the bishops have been buried in the church, which was largely painted in fresco during XIV cent., and plastered over by others. 13. *S. Tomaso Cantuariense*; 1316 by bishop Tebaldo: of brick with a wide nave and apsidal modern chancel; the façade xv cent.; no side windows. 14. *SS. Trinita*. 15. *S. Zeno*, S. Zeno maggiore or S. Zenone, patron of the city and bishop in A.D. 362. The church rebuilt 1138-78, a vast basilica without transepts, Lombard style. Ten steps lead down to the west front (HOPE), in which is one of the earliest of the wheel of fortune windows, executed by Briolotto, who also designed the baptistery, wherein is an inscription recording the window as a work which excited wonder in those times. The rich portal is XII cent. (STREET, p. 110), with an inscription (VERONA, Gualtiero da). The bronze doors at the west entrance of (ix in *Handbook*) XI or early XII cent., of forty-eight plates on pinewood frame are by N. da Figarola (DOOR, metal); GAILHABAUD, *Arch. du Vme.*, ii, 4 plates; a wood lectern in *Illustrations*, p. 183. Shafts along the nave rise to support the roof, two only having an arch across the nave. The lofty trefoiled ceiling of larch timber shows a method of construction which in Italy is almost peculiar to Verona. At the end of the nave is the church raised, having access by a double flight of thirteen steps; the choir or tribune is pointed xv cent. with an apse of XIV cent.; under it is a spacious crypt inserted about 100 years later, the semi-groined roof is supported by forty columns; the stone sarcophagus of S. Zeno was discovered 1838; with another of IX cent. The detached brick and marble campanile at east end was begun 1045 by Martino da Verona, and completed 1178. STREET, p. 109. KNIGHT, ii. *Detached Essay*, Campanile, pl. 26. Near the west entrance is the "coppa di S. Zenone" of high antiquity; a vase of porphyry in one stone 9 ft. (13 ft. 4 ins. in *Handbook*) diameter externally, and 1 ft. 9 ins. thick (8 ft. 8 ins. inner diameter), on a pedestal of another block. The font proper is a Corinthian capital reversed. The cloister dated 1123 (perhaps 1170, STREET) has brick arches, round on the north and south sides, and pointed on the east and west sides, supported by coupled columns of red marble, united at the neck and base; a projection on the north side was the monks' lavatory and formerly contained a basin. *Illustrations*, pl. 92, s. v. Cloister. An old church adjoining has four pillars all unlike supporting groined semicircular arches, dividing it into nine equal squares. In the adjoining disused cemetery is a singular sunk mausoleum having a medieval tomb at the bottom; it is appropriated to Pepin, king of Italy, who died 810 at Milan; the inscription is modern. Near the church is a building called the palace of Pepin, showing forked battlements from which the later builders derived the idea. E. VON SACKEN, *Die Kirche S. Zeno und ihre Kunstdenkmale*, 4to., Vienna, 1865.

The following other churches are mentioned:—*S. Pietro* near castello di S. Pietro, is now in ruins. *S. Pietro Martire*; XIV cent., Gothic and small; with the adjoining buildings it formed part of the monastery of Sta. Anastasia; it is now the *liceo* for

upwards of 500 scholars. Over the entrance is the tomb of Guglielmo (died 1320), count of Castelbarco (BUILDING NEWS *Journal*, xix, 65, 88, 105); others of the same description are in the courtyard; (STREET, p. 80, 82; 92-3; highly praised by RUSKIN). An old wood external door of battens forming panels; *Illustrations*, 1858-59, which also, pl. 56, gives a canopy to a door. *S. Bernardino*; dated 1452 (or 1499); restored 1859. Fine rood and organ loft; good brick corbel courses; altar in middle of choir. Two cloisters, one in front of late Pointed work and perfect; the other of early Lombard work full of decayed and broken tombs. A fine library of the monastery. The circular capella Guareschi, now de' Pellegrini, *cir.* 1550, of greyish-white marble called *brunzo* of good workmanship, is one of the best designs by M. San Michele, continued 1557 by others; and completed 1793 by B. Giuliani and F. Albertolli, who published *Capella della famiglia Pell.*, fol., 1816. *Sta. Elena*, near the baptistry of the cathedral, is like that near the cloister of S. Zeno. It has a crypt in which is an early Christian mosaic. There are some curious tombs, one dating 1177. *S. Giorgio maggiore* or in Braida; rebuilt 1477; the interior with cupola is a rich work completed by M. San Michele; the high altar and principal chapel are after 1559 by B. Brugnoli, who completed the campanile, a noble but somewhat heavy structure designed by M. San Michele. The monastic buildings were sold by the French and now nearly demolished. *S. Giovanni in Valle*; has numerous Roman fragments in its half-ruined walls; and two early Christian tombs in the crypt, discovered 1495, when two figures of monks were added: called of SS. Simon and Jude, in GAILHABAUD, *Arch. du Vme.*, iii, 52. *Sta. Maria della Scala*, founded by Can grande (died 1375), has the exterior in the cinque-cento style, and ascribed to fra Giocondo. Maffei is buried here. *S. Sebastiano* (formerly Jesuits) has a magnificent façade by M. San Michele. The high altar, *cir.* 1690, is by A. Pozzo. The adjoining buildings are now the *ginnasio* for boys; also the communal library. *S. Donino*; in KNIGHT, ii. *S. Lorenzo*; small Romanesque, much modernised; nave, chancel, and two aisles with triforium; HUBSCH, *Altchristlichen Denkmale*, fol., 1866, pl. 38. *S. Biagio*; restored *cir.* 1690 by V. Pellesini; who also 1687 designed the oratory of Sta. Maria della Giustizia called La Disciplina. *Sta. Maria l'Antica*; consecrated XII cent. Attached to it is the cemetery of the Scaligers already mentioned. The tomb of the family conte della Torre in the church of S. Francesco, by M. San Michele. A door in *Illustrations*, 1858-59, pl. 115. *S. Tommaso* (Carmelites). The front by M. San Michele, which if completed would have formed one of his best designs; the upper part of the building is by him; his family tomb is in the church. *S. Paolo* over the bridge; late pointed with square-ended chancel; the stalls placed behind the altar, which is at the west end. *S. Proculo*; desecrated; its west door has a projecting canopy. *S. Orsi*; 1777, incomplete, by O. Calderari. The church of the *Theresian nuns*; that of the *Colomba*; and the Doric chapel in the cloisters of the ruins of *S. Daniele*, were all built *cir.* 1710, and from the designs of L. Perini.

The palazzi by M. San Michele (1484-1559) will be taken first. *Pompei alla Vittoria*, now the picture-gallery removed 1858 from the Consiglio palace; WARING and MACQUOID, pl. 45. *A. Pompei agli Illasi*, was 1699 restored by V. Pellesini: one of these two was (1832-8) the pal. Larezola. *Bevilacqua*, one of his best but a portion only of a large design; of two floors; cornice by another hand; in a neglected state 1863 and 1877. *Canossa*, begun 1527 (or 1593?) for L. di Canossa, bishop of Bayeux, in France; completed 1560; altered and balustrade by another hand. In 1667 the portion of three floors was added from the palazzo on the corso to the river with the loggia, by L. and V. Pellesini; it is usually occupied by royalty visiting the city. Some fine stucco work by B. Ridolfi. *Maffei*, now *Tresa*; of three stories; 1668 bold staircase; view in BUILDING NEWS *Journal*, 1859, v, 1170. *Ridolfi*; *delle Torre*;

and *Gran Guardia* or *Guastaverza*, now *Sparavini*; of graceful design and with good rustic work; or of his school; or 1610 by A. Midano. The door to and perhaps the casa *Pellegrini*; the pilasters and decoration to the piazzetta in front of it is by A. Pompei.

The others are:—Palazzo *pubblico cir.* 1610 by A. Midano though attributed to V. Scamozzi. Pal. dell' *Aquila*, belonged to the Scaligeri, it still retains its towers and the work to the doorway of the inner cortile; it has been much modernised for the albergo delle due Torre. Pal. *Giusti*, and pal. *Guarienti* have the façades painted by Paul degli Uberti, called *Farinato* (1522-1606). Pal. degli *Emilii*, restored 1690 by V. Pellesini; also pal. *Zanobii*, and *Rizzardi* at S. Marco. Pal. *Minischalehi*, painted by T. d'India and ... Aliprandi, now contains the Muscardi museum. Casa in a street at end of the vicolo Cavaletto, being three sides of a quadrangle, with arcades and an external staircase (STREET, 104). Pal. *Catarinetti*, a good specimen of xv and xvi cent. style; a handsome balcony at the angle. Casa *Scannagatti* is a curious specimen of the cinque-cento period. Pal. *Sagramoso*. Casa *Gozzola*. Pal. *Orte Manara*, a large neglected building having fifteen windows on a floor; four atlantides support the balcony. Pal. *Castellani*, 1822; Pal. di *Sambonifazi*, now *Vela*. Pal. *Erlisti*. Pal. della *gran Guardia* 1610 by Andrea Midano, now a corn magazine. Pal. della *gran Guardia nuova* 1840, now the municipio. Pal. *Muselli*. Pal. *Portalupi*; xviii cent., Ionic, with a good staircase. Casa *Cocastelli*, *cir.* 1780 by O. Calderari. The casa de' *Cappelletti*, now an inn, may have been connected with the story of Romeo and Juliet, which is not traced higher than the xvi cent.; the tomb of Juliet was shown in the last century, before Shakspeare was known to the Italians; it has long since been destroyed, and a washing-trough of reddish marble now in the gardens of the Orfanotrofio represents it. The house of the Murati for G. B. della Torre, has good stucco work by B. Ridolfi. Villa *Illayi* 1731 by A. Pompei for himself; who also designed the front of the pal. *Spolverini* next the gardens. Villa *Belfiore* di Porcile, for C. Moneta, has good stucco by B. Ridolfi; and also at house of Fiorio della Seta near ponte nuovo.

The façades of the more considerable houses are decorated with frescoes. The buildings have a character of strength and elegance combined in the details. The long thin bricks and thick joints with frequent alternating courses of bricks and bands of stone give variety; the parapets to gables are very rich. The *vescovado* was altered or rebuilt about 1356; a cortile with fanciful columns has portals xv cent. attributed to fra Giocondo; of the bronze doors, the northern one is ix cent., the other xii cent. In the court is a colossal statue of a crowned female by A. Vittoria. The *museo* lapidario was formed 1617 by the academia filarmonico (suppressed 1810); the marquess S. Maffei added his collections chiefly of inscriptions, for which the portico 1745 was designed by A. Pompei; the scenic part of a small theatre there (given on the title-page of the tragedy of "Il Medeo") *cir.* 1770 is by G. del Pozzo. The edifice of *S. Giovanni* or *S. Zeno* on the hill, for the college of the nobles, of the princes Somaschi, 1670 is by V. Pellesini, who 1675 added the stabling. The seminario arcivescovile, 1783 by O. Calderari, a good work. Collegio de' Fanciulli, 1822 by Malacarne. The large *seminario* and Jesuit college, *cir.* 1710 by L. Perini. The casa dei mercanti or exchange, was erected 1301 by Albert Scaliger; the statue of the Virgin is by Campagna. The large *dogana* with a central court 160 ft. long, *cir.* 1750 by A. Pompei; this or another design is by O. Calderari. The *molo* by L. Salembri. The public cemetery 1832, an enclosure 600 ft. square with arcades all round in which are vaults by J. Barbieri; ALLGEMEINE BAUZEITUNG, 1836, i, pl. 45-7. The teatro filarmonico, 1716 by F. Galli Bibiena, completed by L. Perini, rebuilt 1749 after a fire; teatro nuovo, 1846; teatro Valle or Ristori; teatro Castellani in open air; and teatro Moranda, small and elegant.

In the vicinity is the village of San Michele where the archi-

tect was born in 1484; its round church of La Madonna della Campagna was commenced 1559 by him and continued by B. Brugnoli; the dormitory and grand staircase are by A. Pompei. Near it is a lazaretto dated 1591, being 360 ft. by 789 ft. (357 by 728) with cells opening on an arcade, and a circular chapel in the middle, as given in RONZANI AND LUCIOLI, *Fab. di M. San Michele*, fol., Venice, 1832, p. 33, and three plates. The church at S. Grezano 1678 is by V. Pellesini. At Marzana, is an AQUEDUCT (*Detached Essay*, p. 11), Roman remains and other buildings. At San Giorgio, north of Sant' Ambrogio, is a fine Lombard church where the columns and inscriptions of Luitprand (713-44) were found (LUCCA, p. 149a, for the measures of length).

SARAYNA, *De Origine et ampli. civitatis Veronæ, de monumentis, etc.*, plates by G. Caroto, revised by Falconetto, 30 cuts, fol., Ver., 1540. VALERIO, *Episcoporum Ver. Antiq. Mon.*, 4to., 1576. PANVINUS, *Hist. of Ver.*, and its antiquities, after 1568. VALERINI, *Bellezze di Verona*, 8vo., 1586. F. B. DAL POZZO, *Vite di P. S. A. Veronesi*, 4to., Ver., 1718. CORTE, *Istoria della città di Ver.*, 3 vols., 4to., Ven., 1744. LALANDE, *Voyage en Italie*, 4to., 1747-82, ix. MAFFEI, *Verona illustrata*, fol., Ver., 1732; 8vo., 1771; 4to., 1792; 4to., 1825-26; *Museo Lapidario*, 4to., 1827; *Museum Veronese*, fol., 1749. BIANCOLINI, *Chronicles of Ver.*, 4to., 1745-47; and *Notizie Stor. delle Chiese di Ver.*, 4to., 1749-52. VALESII, *Varie fabbriche antiche e moderne della città di Ver. con galleria Bevilacqua*, 48 pl., fol., Ver., 1753. CAROTO, *Antichità di Verona*, fol., Rome, 1764. *Fabbriche diverse ed antichità*, 4to. BARTOLI, *Diss. del Museo d'Iscriizione*, 4to., 1795. *Notizie*, 8vo., Ver., 1795. PERSICO, *Descr. di Ver., e della sua provincia*, 8vo., Ver., 1820. VENTURI, *Compendio della Storia di Ver.*, 1825, 2nd edit.

SERLIO, *Architettura*, fol., Venice, 1663: 1st edit., 1540. STREET, *Brick and Marble Architecture*, 8vo., 1874, 2nd edit. WEBB, *Continental Ecclesiology*, 8vo., 1848. KNIGHT, *Ecclesiastical Architecture*, fol., 1842-44, ii. WOODS, *Letters*, 4to., 1828, i, 225. STARKÉ, *Travels in Europe*, 8vo., 1839. WARING AND MACQUOID, *Arch. Art. in Italy*, fol., 1850, pl. 25, gives a palace. GRUNER, *Ornamental Art*, fol., 1850, pl. 20, 47, 63. ALBERTOLLI, *Fabbriche, etc., di San Michele*, fol., 1815; and RONZANI E LUCCIOLI, *Fabbriche Civili*, fol., 1832. FREEMAN, *Historical Sketches*, 8vo., 1876. GAILHABAUD, *L'Arch. du Vme.*, 4to., Paris, 1858, iii, pl. 23, gives a door and doorway of a house, and a public well in a street, both of XVI cent. *BUILDER Journal*, 1863, xxi, 782; 801; 1865, xxv, 23, 129; 1882, xliii, 455, describes the flood of Sept. *BUILDING NEWS Journal*, 1869, xvii, 432, 484, 502. *ARCHITECT Journal*, April 1879, p. 198. RUSKIN, *Drawings—illustrative of the Architecture of Verona*, 8vo., 1870. Other *Illustrations* are brickwork, pl. 43; campanile, pl. 51, chimney, pl. 74 and 75; corbel, pl. 95; ecclesiastical sculpture, pl. 124; metal work, pl. 208. 1. 12. 14. 15. 25. 26. 28. 50. 96.

VERONA MARBLE. Near Sant' Ambrogio are the marble quarries from whence much of the *Rosso di Verona* is excavated as well as the *nemba* and *brancone*. The workmen are masons and sculptors professed from father to son as at Como. Nummulite (fossils) limestone was largely used as marble in Verona, Padua, and other cities of northern Italy, by the Romans and their successors. It is of two varieties, orange combined with red inclining to yellow, of which it is said the tomb of Petrarch was made; and white with yellow and reddish tints employed by the Romans, as at the amphitheatre, it lasts well; also largely at Venice, in the churches, arcades on south side of doge's palace, portal of S. Marco, campanile, academy of Fine Arts, etc. BURNHAM, *Limestones and Marbles*, 8vo., Boston, U.S.A., 1883, p. 5, 191.

The altar of S. Vincent in the church of Sta. Anastasia, in Verona, is built of the beautiful "bronzino" marble peculiar to this country, which is also introduced into the ornaments of the church; it is so called from the metallic sound which it emits when struck by the tool.

VERONA (fra GIOVANNI GIOCONDO DA). See GIOCONDO (G.).

VERONA (fra GIOVANNI), born about 1469, of the monastery of Monte Oliveto di Chiusuri, in the territory of Siena, the most celebrated worker in inlaid woods of the XVI cent., was summoned to Rome by pope Julius, to execute the carving and veneering of the woodwork in the camera della Segnatura, 1511-14, which was removed by Paul III. He executed 1499 the *intarsiatura* in the sacristy of Sta. Maria in Organo at Verona, still in good preservation; 1533 designed the campanile of that church; did the woodwork of the choir of his monastery; and of the choir of S. Benedetto at Siena; also at Naples, in the sacristy of Monte Oliveto; and the chapel of Paolo da Tolosa. He was prior of Sta. Maria Nuova, and died in 1537 aged 68. FRANCO, *Vita di fra G.*, fol., Verona, 1863; in MUNTZ, *Raphael*, transl., 8vo., 1882, p. 352. VASARI, *Lives*, 8vo., 1851, iii, 21, 430; iv, 114.

VERONA (GIOVINTINO DI, GIOVIANO, and MARTINO DA), are named by MAFFEI, *Verona Illustrata*, 8vo., Verona, 1731, iii, 136, as early Lombard workers at Verona.

VERONA (NICOLA and GULIELMO DA). This first name occurs in the inscription "artificem gnarum qui sculpsit haec Nicolaum", under the figure of Adam and in other parts of the portal of the church of S. Zeno, at Verona; together with "Salvet in aeternum qui sculpsit ista Gulielmum", who is also supposed to have been the architect (1099 Guglielmus Lanfrancus, or LANFRANCO FACCIO) of the duomo at Modena. (CICOGNARA, *Scultura*, fol., Ven., 1813-18, i, 322.) 28.

VERONIKHIN (...). See VORONIKIN.

VERPOYLE (SIMON), was invited to Ireland by lord Charlemont about 1773 when he built the Marino near Dublin (designed by sir W. Chambers), to make models and ornaments for his new buildings. John Smith was a pupil. WARBURTON, *Dublin*, 4to., London, 1818, ii, p. 1250.

VERROCCHIO (ANDREA DEL), also a painter, goldsmith, and sculptor, born 1432 at Florence, was a pupil of Donatello (BALDINUCCI, *Notizie des Professori*; RUMOHR, *Ital. Forsch.*, ii, 302). His first great work was 1472 the tomb to Giovanni and Piero de' Medici, sons of Cosmo, in the church of S. Lorenzo, at Florence; the sarcophagus is of porphyry, the decorations of bronze; GONNELLI, or GOZZINI AND LASINIO, *Mon. Sepol. della Toscana*, fol., Fir., 1819, pl. 13. He cast the copper ball, and fixed it on the summit of the dome of Sta. Maria del Fiore, four ells in diameter; it weighed 4,368 lbs.; but was replaced by another and larger one having been thrown over by lightning. He designed the model for the celebrated equestrian statue of Bart. Colleoni of Bergamo, at Venice; it was cast by A. Leopardi, after the death of Verrocchio in 1488, aged 56; the pedestal and fixing the statue 1495 were also by Leopardi. Among his pupils were P. Perugino; L. da Vinci; Franc. di Simone; Agnolo di Polo who worked in terra-cotta; N. Grosso; and L. di Credi, who removed the body of his master from Venice to Florence and deposited it in the church of S. Ambrogio, in the vault of ser Michele di Cione. VASARI, *Lives*, 8vo. edit., London, 1851, ii, 250-62. GRANDJEAN ET FAMIN, *Arch. Toscane*, fol., Paris, 1875, pl. 32, which gives the statue fountain in the court of the old palace. CICOGNARA, *Scultura*, fol., Venice, 1813-18. 14. 30. 73.

VERSAILLES. A town near Paris. It contains the palace, park, and fine houses of the courtiers of Louis XIV and XV. The estate and old château were 1632 sold to Louis XIII who commenced building a hunting mansion, which forms the nucleus of the present edifice. Louis XIV had the estate apportioned and the individuals compelled to erect appropriate residences. The plans for the new palace were furnished 1661 perhaps by Le Vau le jeune; continued 1665 by L. le Vau, who added two pavillons and orangery, or three chief corps de logis; continued 1670-4 by J. H. Mansard, inhabited Feb. 1673 while incomplete, and finished 1680 or 1684, having been seven years erecting. The gardens were laid out by Le Notre; replanted in 1775. The garden front is 1,362 ft. in length. The chapel 105 ft. long and 79 ft. high, for Louis XIV, was designed 1699-

1710 by J. H. Mansard; also the orangery 1685-6. The theatre or opera-house was designed 1753-70 by J. A. Gabriel for Louis XV; also a pavilion, with internal alterations and general renovation, and 1772-74 part of the wing near the chapel, royal banqueting room 80 ft. by 69 ft. by 58 ft. high. Le grand Trianon was built 1687 for Louis XIV by J. H. Mansard, and le petit Trianon 1766 for Louis XV. Napoleon 1st in 1807 employed J. Gondouin to prepare plans of restoration; in 1811 Percier and Fontaine were so employed, but the estimate was too much. Under Louis XVIII, 1818 the royal apartments and gallery were repaired, Gabriel's façade towards Paris completed, and the interior fitted up; 1820 pavilion corresponding to that of Louis XV built, approaches cleared, etc., 6,000,000 fr. being spent. In the *BUILDER Journal*, 1843, i, 251, an estimate of the cost of this wonderful palace is stated by Janson, architect. For Louis Philippe the interior of the palace was converted into a national museum 1833-37 by C. F. Nepveu; the salle d'opéra restored, and the theatre renovated, at a cost of about £900,000. There are many subsidiary buildings; and mansions and buildings of good design in the town.

At the end of the XVII and during the XVIII centuries there were many books of views published, and fine engravings. The more architectural books are MANSART, *Livre de diff. Corniches, etc., sur les dessins*, fol. CHEVOTET, del., *Plans, Coupes, etc., des châteaux de Vers. et de Marly*, 46 pl., fol., Paris, 1714-5. LE PAUTRE, *Plans, etc., de la Chapelle*, fol., Paris, n. d. BLONDEL, *Arch. Française*, fol., Paris, 1752-56, iv, 91-3. *Versailles; Palais, Musée, Jardins*, 8vo., Paris (1830-48). ANON., *Notice Hist. des Peintures et des Sculptures du palais*, 8vo., 1837. HEATH, *Picturesque Annual*, 8vo., 1839. PALAISEAU, *Vers., etc.*, 8vo., 1839-40. LABORDE, *Vers. Anc. et Moderne*, 8vo., 1839. DULAURE, *Environs de Paris*, 6 vols., 2nd edit., 8vo., Paris, 1838; and new edit. (1859). GAVARD, *Vues intérieures du Palais de Vers.*, 31 pl., fol., Paris, 1838, etc. BOURASSÉ, *Residences Royales et Impériales de France*, 30 cuts, 8vo., Paris, 1864. ROUYER ET DARCEL, *L'Art Architectural en France*, 4to., Paris, 1866, ii. DALY, *Revue Générale*, Index. TRAINÉ, *Ancient Régime*, 8vo., 1876, p. 87, etc. DESJARDINS, *Le Petit Trianon, hist., etc.*, 8vo., Vers., 1885.

VERSCHAFFELT (PIERRE ANTOINE), also a sculptor, was born 8 May 1710, at Gand. He designed at Mannheim, the theatre; the library of the arsenal; and restored the palacio de Pruyssenheim. Designed the church at Oggersheim; and the Roman Catholic church at Nuremberg; the high altar under the dome at Worms; and the decoration of the choir of the cathedral at Gand. He was architect and conseiller at the court of the duc Palatin at Mannheim; and member of the academy of S. Luca at Rome. He died 5 April 1793 at Mannheim. GOETGHEBUER, *Choix des Mons.*, fol., Ghent, 1827. 68.

VERSCHAFFELT (MAX VON). H. Karl von Fischer was placed 1796 as a pupil with this *Oberbaudirektor*, at Mannheim.

VERST. A Russian measure of length = 3,500 or 3,498.98 Russian or English feet. ARSCHINE.

VERSURÆ (Gr. *περίδροτοι*). The painted scenery at the sides or ends of the stage which served as wings; these were upright triangular frames made to revolve upon a central pivot so that any one of the sides could be turned towards the audience.

VERSUS. First, a furrow, because at the end of it the plough was turned round. Second, it was in Campania and among the Oscans and Umbrians, a plot of ground of 10,000 square feet. Third, in Dalmatia, the versus was 8,640 square feet. The feet were different. ACTUS. O. C. P.

VERTICAL GUTTER. Where two roofs meet at right angles; or where the end of one roof joins the side of another; they may be formed of 6 or 7 lb. lead, whereas the parallel gutter should be laid of 9 or 10 lbs.; *BUILDER'S MAGAZINE*, 4to., 1774; 1789, p. 237. A wood trough down pipe for rainwater is usually called a "trunk".

VERTICAL LINE in architecture; see HORIZONTAL LINE.

VERTUE (ROBERT). In 1501, July 31, he received £40 in part payment of £100 for "bilding of a toure in the Toure of London"; Privy purse expenses of Henry VII, in BENTLEY, *Excerpta Historica*, p. 125. He was one of "ye Kinges iii Mr Masons", as named 1509 in an "estimate of ye charge for ye makinge of a tombe for kinge H. 7", which was subsequently discarded. The others were Jenins and Lebens or Lobons.

VERTUE (WILLIAM) with J. HYLMEER, freemasons, June 1505, 21st Henry VII, agreed to construct the vaulting to the choir of S. George's chapel, Windsor. "The roofing of the ailes and the centre compartment of the body of the building are of the period of the chapels of King's College at Cambridge, and of Henry VII's; but the vault of the nave and choir differ essentially from *fan* vaulting both in drawing and construction. It is in fact a waggon-headed vault broken by Welsh groins; that is to say, groins which cut into the main arch below the apex"; POYNTER and ASHTON, *Windsor Castle*, fol., 1841, as quoted in TIGHE AND DAVIS, *Windsor Castle*, 8vo., London, 1858, i, 425. In August 1514, W. Vertue and W. Est, freemasons, with H. Coke, carpenter, were masters of the works of the bishop (Fox) of Winchester's new college of Corpus Christi, at Oxford; CHURTON, *Life of Fox*, 8vo., p. 289.

VERULAMIUM. The once famous Roman city, on Watling street, about half-a-mile from S. Alban's, Hertfordshire. A British town captured by Julius Caesar, then raised to a municipality, and taken from them by the British under Boadicea. The remains of the Roman walls were still extensive and in parts well preserved. The amphitheatre was discovered 1848 by the St. Alban's Archit. Society, as shown in ILLUSTRATED LONDON NEWS, xii, 58. Within the walls was Verulam house, the seat of lord Bacon. In June 1852 the site was purchased by the Freehold Land Society; and in August 1853 it was offered for sale. *ARCHÆOLOGIA*, i, 143, 158, 189, 209; xxviii, 400; xxx, 441; xxxiii, 262. Roman wall, ii, 184; iv, 84.

VESANZIO. See SANTEN (J. VAN).

VESEY (right hon. AGMONDESHAM), built a "house on a plan of his own formation at Lucan, a few miles from Dublin. He died 11 August 1786. The house is a good one, but no wise remarkable as a work of art"; CROKER'S Boswell's Johnson, 8vo., 1860 (Murray), 298, 663.

VESICA PISCIS. A form produced by the geometrical process of raising an equilateral triangle from a given base line, as directed in the first proposition or problem of Euclid, known by the Latin translation by Boetius (born 470), and known to Theodoric. The form produces two pointed arches set base to base; and that is the form termed "vesica piscium" by Albert DÜRER, *Institutionis Geometricæ*, fol., Arnheim, 1606, lib. ii, 56, which apparently means, a fish's bladder, or a bladder distended by wind to the form of a fish. It is called EYEFORM in 1551. In a volume of "Hours" printed at Lyons, circa 1595, is a cut of "the measure of the wound" of Jesus Christ, to be used as a charm, vesica-shaped within a lozenge; BRITISH ARCHÆOLOGICAL ASSOCIATION, 24 April 1867.

As an elongated aureole (Ital. *mandorla*, i.e., almond, kernel), it has been used to enclose a figure of the Almighty, the Saviour, the virgin, or patron saint of a church. The first occurs in a picture by Bart. Vivarini (1459-98), dated 1480; around the virgin, by Duccio di Buoninsegna (? 1282-1339), both in the exhibition at the Royal Academy, January 1885, No. 206 and 251 of the catalogue. Also, as a symbol of our Saviour by early Christians (Gr. *ἰχθύς*, fish); was the symbol of originality and reproduction (DURANDUS, *Rationale Divinorum Officiorum*, 1296 (?) transl. by NEALE and WEBB, 8vo., Leeds, 1843, intro. lxxxi). It is to be seen in the Norman entrances at Rochester cathedral, Barfreston church, south porch at Malmesbury abbey, the prior's door at Ely (KING, *Eastern Cathedrals*, p. 223). In the porch of S. Trophemius at Arles; front of S. Pierre at Angoulême; Romanesque façade of N. D. de Poitiers, middle of XII cent.; a half vesica enclosing a lamb occurs at west door of church of S. Cunibert, Cologne.

A window of this outline occurs at Romsey church, Hampshire, Beverley minster, Salisbury cathedral. A boss in York cathedral. The rose-window in south transept at Lincoln cathedral. The west window of Dumbane abbey, as in RUSKIN, *Lecture on Arch.*, 8vo., 1854, p. 30, pl. 4, fig. 7. FREEMAN, *Window Tracery*, 8vo., 1851.

It was a monogram, which has been supposed to be connected with the plan and form of a church erected during the mediaeval period. PROPORTION. GWILT, *Encyclopædia of Arch.*, 8vo., 1888, p. 1007, 1010-11, 1013-4, 1043. Mediaeval seals of ecclesiastical and other communities were designed on the same form, and of late years it has been imitated for those of some archaeological societies. GODWIN, *Sketches in Poitiers, etc.*, in CIVIL ENGINEER, ETC., *Journal*, 1842, v, 113. DALY, *Revue Générale*, s. v. Nimbe, 1840, i, 649-732. KERRICH, *Use of the V. P.*, the mysterious figure in *Architecture of the Middle Ages and Gothic Architecture*, 4to., 1820; in ARCHÆOLOGIA, xvi, 314; xix, 368. HAWKINS, *History of Gothic Architecture*, 8vo., 1813. DIDRON, *Christian Iconography*, 8vo., 1851, i, 108, s. v. Aureole.

VESONTIO. The ancient name of BESANÇON, in France.

VESPASIANUS (TITUS FLAVIUS). Born 17th Nov., A.D. 9, at Reate, was emperor of Rome from 69 to 79 A.D. He rebuilt the temple (now lost) to Claudius; repaired the streets of Rome and roads to the provinces; repaired the aqueducts and enlarged the sources which supplied the fountains; began the reconstruction of the Capitol; reconstructed the archives of national history in the Tabularium; built the great temple to Peace, dedicated A.D. 77, in which he deposited the precious spoils of Jerusalem (burnt under Commodus and restored by him); also the forum surrounded by colonnades; 72-81 A.D. the Coliseum (GAUDENTIUS, architect). He extended the pomerium, excavated a tunnel to give a more gentle descent to the Flaminia via; and rebuilt the temple to the mother of the gods at Herculaneum; while also in the provinces he rebuilt, at his own expense, cities ruined by earthquakes or by fire; constructed roads without molesting the bordering proprietors; erected useful monuments; and terminated the disputes of communities with reference to their boundaries. The temple to Jupiter Tonans (so called) also called Temple of Saturn, but now of Vespasian, in the forum; three Corinthian columns standing on a lofty Travertine terrace are all that remain. The inscription on the architrave copied whilst entire in VIII cent., refers to a restoration by Septimius Severus and Caracalla. Agrippa rebuilt a temple at Rome to Honour and Virtue; removed the colossus of Nero (ZENODORUS); and restored the theatre of Pompey. DUBOY, *History of Rome*, 4to., 1886. BURN, *Rome and the Campagna*, 4to., Cambridge, 1871-6. 11. 14.

VESPIGNANI (conte commendatore VIRGINIO), of Rome, architect to S. Peter's in the Vatican; and of the confessionne, enlarged and renewed in the crypt of the Basilica Liberiana; designed the building for the great exhibition at Rome, in the vast corridor of the cloisters of the Baths of Diocletian, Sta. Maria degli Angeli; an immense circular saloon; a mile of corridor for sculpture; BUILDER *Journal*, 1870, xxviii, 89. On 19 May 1869 elected an H. and C. member of the royal institute of British architects. He died 3rd Dec. 1882.

VESPRIM, Veszprim, or Veszprem (Vesprimium). A town near Buda, in Hungary, situated on the river Sed. It is the see of a bishop. The cathedral dedicated to S. Michael the archangel, is in the Pointed style and a fine structure. There are also the ruined castle, bishop's palace, Piarist gymnasium, and other buildings. 50. 96.

VESSEL. See VASE. JAR in construction. ECHEIUM.

VESTA, whose altar marked the centre of domestic life in the house and of political fire in the city. There were four temples to her in Greece, at Hermione in Argolis was a special temple. Behind the *regia* or house of Numa at Rome was the head pontiff's residence; behind it were the *atrium* and *temple* to Vesta. PRYTANEIUM. Her sanctuary at Rome stood in the Forum, between the Capitoline and Palatine Hills, and not far

from the temple of the Penates. Her temple was round with a vaulted roof, perhaps as an imitation of the vault of heaven. No statue, but a fire on the hearth or altar was kept up by the vestals, her virgin priestesses, of which there were four and increased to six in Rome. Excavations made 1497 between the church of SS. Cosma e Damiano and of Sta. Maria Liberatrice at Rome led to the discovery of fourteen pedestals of the Virgines Vestales Maxime, four of which belong to the Cælia Claudiana (ALDOBRANDINI, *Delle statue antiche di Roma*, 1556; GRUTER, *Inscr. Romanæ*, p. 309-11), one of which was found 1877 used in the restorations of the palace of Augustus and removed by Theodorici from the little grove by the temple. In November 1883 were found other pedestals marking one side of the celebrated Atrium Vestæ. COMPANION TO ALMANACK, 8vo., 1885, p. 158. ARCHÆOLOGIA, 4to., 1886, xlix, 391-5; and i, 227, 231; and at Silchester, i, 267. *Rome in 1889*, in NINETEENTH CENTURY, 8vo., Oct. 1889, p. 587-8. JORDAN, *Tempel der Vesta*, 4to., Berlin, 1886. The church of S. Theodore has been erected on the foundations of a circular edifice, probably that of Vesta, above described.

The circular row of pillars attributed to Vesta, in the Bocca della Verità at Rome, is not to be confounded with the famous temple in the forum. Temple of Vesta at TIVOLI is now known as that of the Sybil. Another at Assisi, is named in DALY, *Revue Générale*, 1845, vi, 36; that at Rome, vii, 109.

VESTIARIUM. VESTIARY, a vestry. In the ancient basilicas a chamber on the right of the apse, called also prothesis, paratorium, oblationarium, offertorium, secretarium, and thesaurus, was used for keeping the offerings and vestments. BINGHAM, *Origines*, 8vo., London, 1840, ii, 476. A wardrobe or place to lay clothes or apparel in. 25.

VESTIBULE (Lat. *ante capitulum*). The great vestibule; the porch in front of a church, as to S. Gereon at Cologne, and at Durham; examples at Rome: at S. Agnese fuori de mura; S. Alessio; S. Ballina; S. Bartolommeo; S. Cecilia; S. Crisognono; S. Giorgio in Velabro; S. Giovanni ad Portam Latinam; SS. Giovanni et Paolo; S. Marco; S. Maria in Trastevere; S. Pietro in Vincoli; S. Sabina; and SS. Vincenzo ed Anastasio; or in front of a church or chapel. ANTE CHAPEL. ANTE PORTICUS. ATRIUM. GALILEE. NARTEX. PARVIS and PORCH.

A vestibule or passage often led to the CHAPTER-HOUSE, as at Chester, Lichfield, Lincoln, Ely, Bristol, Salisbury, Southwell, Thornton abbey which rivalled Southwell (ASSOCIATED SOCIETIES, *Reports and Papers*, ii, 149-160; and 1888, lxy): S. Mary's abbey and palace at York, 1154-81 (BUILDING NEWS *Journal*, 1877, x, 6. At Westminster, BUILDER *Journal*, 1885, xlviii, 355, 381. SCOTT, *Lectures*, 8vo., 1879, i, 108. DALY, *Revue Générale*, 1840, i, 322-4; 454. On Vestibules, by F. Lush, in BUILDER *Journal*, 1859, xvii, 453. TRISANTIA is the part of the cloister next the chapter-house. 25.

VESTIBULE. An antehall, porch, or lobby. The room which first presents itself on entering a house and leads to the apartments, but is generally a LOBBY of more or less importance. CORRIDOR. A vestibule in many cases is so far equivalent to an anteroom, that the only difference lies in the vestibule being a thoroughfare only, and the ANTEROOM something more. A lobby again is so far an inferior vestibule. But it is chiefly when the apartment is a sort of diminutive hall, for access to a certain group of doors rather than to one individual door, that it becomes more properly a vestibule; KEER, *English Gentleman's House*, 3rd edit., 8vo., 1871, p. 175. Entrance porch or corridor, examples in DALY, *Décorations, ext. et intér.*, fol., Paris, 1872. Others in BUILDER *Journal*, *Johannisstift*, at Leipzig, 1880, xxxix, 21; of Art Exhibition at Munich, 1883, xlv, 418; in Swiss Exhibition at Zurich, 1883, xlv, 572, 587; to the palais de justice at Bruxelles, 1885, xlix, 12. 14.

VESTIBULUM. In a Greek and Roman house; the passage leading to the house door from the public road; i.e., as before the door of a palace or any superior private house. It was sometimes covered and had seats. Part of the andronitis of a Greek house, similar, probably, to the *prostas* of the first peristyle or

court. The prothyrum or PROTHURON, was the passage room between the outer or house door and the inner door which closed the entrance to the atrium. This vestibule sometimes consisted of one or more apartments and was always open for the reception of those who would wait until the inner door was opened. CICERO, *De legibus*, ii, 24, 61, names the peribolus of tombs called vestibulum or forum; FALKENER, *Classical Museum*, 8vo., 1851-52, i, 177. PORTA. PORCH. PASTAS. PRONAOS. 19. 25. 78.

VESTORIANUM. A blue colour so named from its inventor, and made at Puteoli; CAERULEUM.

VESTRY, Vestuary, Vestiaria, and Revestry. A room attached to a church where the vestments are kept and the clergy vest themselves. Also called the SACRISTY in churches on the continent, where it is often large and sometimes consists of two or more rooms, for also keeping the plate, music-books and such like. In England, it has been the custom to hold meetings of the parishioners in the vestry for parochial purposes. 14.

VESTRY HALL. The building wherein parishioners meet for the despatch of parochial business, and wherein the officers carry on the parish work. This meeting being commonly held in the vestry adjoining or belonging to the church, took its name from the building. Chelsea, proposed, *BUILDER Journal*, 1858, p. 851, and Islington, p. 59. Bancroft Road, Mile End, 1862, xx, 169. S. Mary Newington, 1866, p. 387. Camberwell, 1872, p. 217, 286. Chelsea, 1855, xlix, 618, 622; 698, 703. Fulham, 1886, l, p. 638, 648, 653. Westminster Parochial Offices, 1880, xxxix, 453, by Lee and Smith, and opened 19 July 1883, p. 112.

VESUNNA. The modern PÉRIQUEUX, in France.

VESZPRIM or Veszpreim; see VESPRIM, in Hungary.

VETERINARY COLLEGE. Established in 1791 in London for the study of diseases incident to the horse, for the improvement of farriery generally, and a pharmacy for medicine. The first was established 1761 at Lyon; DALY, *Revue Générale*, 1872, xxix, pl. 27, p. 113, gives a new amphitheatre; also iii, 191, the expenses at Charenton, 1833-41; and xxix, 115, sanitary arrangements at Lyon. Alfort, a hamlet in dep. Seine, in France, is celebrated for its veterinary school, the largest establishment of the kind in the country, established 1766, having a special library, a cabinet of comparative anatomy, and one of pathology; hospitals, botanic garden, laboratory, etc. Berlin; the *Koenigliche Thierarzneischule*, designed by Hesse, in *ALLGEMEINE BAUZEITUNG*, 1843, pl. 493.

VÊTHEUIL (Lat. Vethelium). In the department of Seine et Oise, near Mantes, in France. The church dedicated to Notre Dame is of three epochs; the choir XII cent. erected by Henry II of England, the tower XII century or before 1370; the sacristy 1533, and the nave, west door, and the transepts; it was completed in 1550, and consecrated 1588. Façade, plans, etc., in GAILHABAUD, *Monuments*, 4to., Paris, 1842-52, 2 pl. *BUILDING NEWS Journal*, 1876, xxxi, 621, gives the south façade. VIOLLET-LE-DUC, *Dict. Rais.*, iv, 296, and v, 192. COMMISSION DES MONUMENTS HISTORIQUES, *Archives*.

VETHYM, Fethym, or Vathym; and "brachium" in William of Worcester, p. 186, 189. FATHOM. 17.

VETTIUS (CHRYSIPPUS). A freedman of the architect Cyrus, and himself also an architect. CICERO, *Epist. ad Attic.*, xiii, 9; xiv, 9; *Ad Fam.*, vii, 14.

VETTIUS (TITUS); son of Quinto of the tribe Sergia, was T. VETTIVS. Q. F. SER. ARCHITECTVS the architect of the portico grumentino, "che curò di fare mercè la pecunia paganica l'anno 711 di Roma (43 B.C.);" found at Saponara di Grumento. ACCADEMIA DE' LINCEI, *Notizie degli Scavi*, 4to., Rome, 1877, p. 130.

VETTONE (...), built 1742, the church of Sta. Chiara, at Bra, in Piedmont, south of Turin, "in the most luxurious style of the Piedmontese churches." 28.

ARCH. PUB. SOC.

VETULONIA. Ruins near Magliano, a village between the Osa and the Albegna, about eight miles inland, was discovered May 1842 by T. Pasquinelli, who showed it to DENNIS, and is now considered to be the site of this little known ancient town; *Cities, etc. of Etruria*, 8vo., 1878, ii, 263.

VEXILLUM. A banner attached to a bishop's crozier where grasped by the hand, to prevent perspiration soiling the staff. R. U. R.

VEUSURA. See VOUSURE and VOUSOIR.

VEZELAY (Anc. Viceliacum). A town near Auxerre, in the department of the Yonne, in France. It is surrounded by embattled walls and retains two of its feudal gateways. The very remarkable abbey church, dedicated to La Madeleine, was burnt 1120; the narthex of two floors dates 1130; as usual in Burgundian churches it has a gallery over it; DALY, *Revue Générale*, 1856, xiv, 59. Three inner porches XI and XII cent. lead into the nave, which has no triforium; a cradle roof. A flight of steps leads up to the choir, which with its crypt and the transepts are Pointed of XII and XIII cents. The apse has nine columns each of a single stone. The chapter-house is vaulted dating from 1165. The edifice was under restoration from 1840 for the government by E. E. Viollet-le-Duc, and has suffered by the chiselling. It is 404 ft. long, the choir 70 ft. high. MERIMÉE, *Notes d'un Voyage dans l'Ouest de la France*, 8vo., Paris, 1836. SOMMERARD, *Les Arts du Moyen Age*, fol., Paris, 1838-46; Ser. 1, pl. 4; and ser. 3, pl. 22. LA BORDE, *Monuments de France*, fol., Paris, 1816-36, pl. 142. THIERRY, *Lettres sur l'Histoire de France*, 7 edit., 8vo., Paris, 1842. COMMISSION DES MONUMENTS HISTORIQUES, *Archives*, 3 pl. Scarcely any remains exist of the monastery which was so vast that kings with their suite could be easily lodged. MARTIN, *Hist. de Monast. de Vez.*, before 1843. Numerous references in VIOLLET-LE-DUC, *Dict. Rais.*, Index s. v. Paper on "Galilee at Durham" in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1890. 28. 96.

VGO is inscribed on the architrave of the cathedral at Apt, in France. LANCE, *Dict. Biog.*

VIA. The Roman mode was to form the road by 1, *statumen*, slabs one foot thick as foundation; 2, *rudus*, or concrete of 9 ins.; 3, *nucleus*, or fine beton of 10 ins.; and 4, *summa crustum*, or paving of 8 ins., making a thickness of 3 ft. 3 ins., the paving being of polygonal stone blocks, while the Greek roads consisted of oblong blocks. The Romans considered their high military roads as national works, paving them with great care and commemorating their execution by striking medals in honour of the event and erecting memorial arches to record the consul or emperor under whose direction the work was done; the medals were struck with the words QUOD VIA MVNTAE SUNT, DONALDSON, *Architectura Numismatica*, 8vo., 1859, Nos. lx and lxi, p. 235. ROME. The road to ALBANUS MONS is quoted as the most perfect specimen of the Roman via. TRIVIUM (three ways). QUADRIVIUM (four ways). PRATILI, *Via Appia*, fol., Nap., 1745; INST. DI COR. ARCH., *Its Route and Monuments*, fol., 1829-85, v, pl. 45-7; 57-60. Alex. THOMSON of Banchoory, *Via of the Romans*, in CIVIL ENGINEER, ETC., *Journal*, 1855, xviii, 257. BERGIER, *Hist. des Grands Chemins de l'Empire Romain*, 4to., 1622; Lat., Eng., and Ital., 4to., 1729; 1736; 4to., Brux., 1728. CALMEL, *Diss. sur les Grands Chemins de la Lorraine*, 1727. D'ANVILLE, *Geog. de l'Antienne Gaul*, etc., 12mo., 1741. LABRUZZI, *Via Appia, ad urbe Roma ad Capuam*, fol. (London, 1794). MARSIGLI, *Danubius Illustratus*. STEGER, *De Viis Militaribus veterum Rom. in Germania*, 4to., 1738. HETZRODT, *Notice sur les anciens Trevirois, etc., sur les Chemins, etc.*, 8vo., 1809. LEGER, *Les Travaux publics, etc., aux temps des Romains*, 8vo., Paris, 1875, p. 143-250, and pl. iii. A list of the *Via* of Rome is given in BURN, *Rome and the Campagna*, 4to., Cambridge, 1871. DENNIS, *Etruria*, 8vo., 1878. 25.

In England; in Yorkshire, map in VETUSTA MONUMENTA, i. ARCHÆOLOGICAL JOURNAL, *The Four Roman Ways*, by E. Guest, 1857, xiii, 386; xiv, 99. In Lancashire and North Cheshire,

by Dr. Robson, *idem*, xxv, 1868, p. 333. HUSSEY, *Roman Road from Alchester to Dorchester*, 8vo, 1841. MACLAUCHLAN, *Walling Street*, fol., 1852. REYNOLDS, *Iter. Britt.*, 4to, 1799. "Roads, paved", in *ARCHÆOLOGIA*, Index, vols. 1 to 50, 4to., 1889. *Journal of the ARCHÆOLOGICAL ASSOCIATION*. WRIGHT, *Celt, Roman, and Saxon*, 8vo., London, 1852; 3rd edit., 1875. BABINGTON, *Ancient Cambridgeshire*, in *CAMBRIDGE ANTIQ. SOCIETY*, 8vo., 1851, No. 3.

VIAR (JUAN DE ORTEGA DE LA), 1588 worked at the decorations at the archivo at Simancas, near Valladolid. 66.

VIADER (PEDRO), 1388 was assistant to el maestro Roque at Barcelona cathedral, and is said to have commenced the cloister.

VIADERO (FRANCISCO), 1660 succeeded F. de Campo Aguero as maestro mayor or arquitecto at the cathedral of Segovia; he died 18 October 1688 and was buried in the cloister. Biadero of MILIZIA is an error copied from PONZ. 66.

VIADUCT. An elevated structure usually consisting of a series of stone or brick arches, and very similar in appearance to an AQUEDUCT (*Detached Essay*), but constructed for the conveyance of a roadway, or railway, instead of water. A viaduct is also made of timber, and of iron, on the score of economy. It is an extended BRIDGE, not only for crossing a river, but a valley, or other work below the level of the viaduct itself. An EMBANKMENT may likewise be called a viaduct when carrying a traffic-way. The top surface of the arches should be coated with a thick layer of asphalt to render them water-tight, and therefore available for stores in the space under them. BARBACOA. BUND. CAUSEWAY. DAM.

SIMMS, *Public Works of Great Britain*, fol., 1838. HANN, HOSKING, and BURNELL, *Theory and Practice of Bridges, etc.*, 8vo., 1843. ROY, *Essai d'Arch. Pratique de la Const. des ponts et viaducs en maçonnerie*, 8vo. LECOUNT, in *Encycl. Britannica*. DEMPSEY, *Builder's Guide*, 8vo., 1851. FONTENAY, *Construction des Viaducs, Ponts, Aqueducts*, 8vo., Paris, 1862. HASKOLL, *Bridge and Viaduct Construction*, 3 vols., fol., 1864 and 1868. MAYNARD, *Viaduct Works Handbook*, 8vo., 1868. CLAYTON, *Bridges and Viaducts of the Present Day*, read at Roy. Inst. of Brit. Architects, Sessional Papers, 1855-56. DALY, *Revue Générale*. ALLGEMEINE BAUZEITUNG. ENGINEER and ENGINEERING JOURNALS.

VIALA (JOSEPH); see ZANINI (G. VIOLA).

VIANELLI (BALDASSARE), of Padua, was employed 21 April 1539 on the cathedral at Milan. FRANCHETTI, *Duomo*, fol., Milan, 1821, p. 144.

VIANEN (GYSBERT TENNISZ VAN), was possibly the builder of the Katheringen gate, at Utrecht, from the design of P. MOREELSE. 24.

VIANI (ANTON MARIA), called il Vianino, of Cremona, also a painter, a pupil of G. Campi, worked 1598 at Mantua for the duke Vincenzo Gonzaga; he designed the church of S. Orsola; assisted G. Pippi (Romano) at the palazzo de Conti Colloredo; 1609 designed the church of S. Maurizio; and many altars. CADIOLI, *Descr. delle pitture di Mantova*, 8vo., Mantua, 1763, p. 29-31, 39, 52, 71, 74, 90. ZAIST, *Notizie—Cremona*, 4to., Crem., 1774, ii, 63. 68.

VIANT (.....). See VIART.

VIARD'S PAINT 1855. See PAINT.

VIA REGALIS. See TRIUMPHAL AVENUE.

VIART (CHARLES), designed 1526 the hôtel de ville at Beauncy, said to be a copy on a smaller scale of that at Orleans, which writers usually place first, as BERTY, *Renaissance Mont.*, fol., Paris, 1862-6, i, 209, 300; pl. 33-5. He designed the hôtel de ville at Orleans, which 1825 is the musée of local antiquities, to which the date of 1442-98 is given, but LANCE, *Dict. Boog.*, gives 1543-98; the upper stage was by Robin Gallier; VERDIER ET CATTOIS, *Arch. Civile et Dom.*, 4to., Paris, 1852-55, ii, pl. 60-3. He also designed about 1547 the salle S. Lazare de l'hôtel Dieu at Orleans. He may have been connected with Nicolas BIART of Amboise, 1460-1506, and Phillipot VIART, sculptor of Rouen,

who about 1460 carved the eighty-six choir stalls in the cathedral. LABORDE, *Catalogue des Artistes employés à la cour des ducs de Bourgogne*, 8vo., Paris, 1849. VIOLLET-LE-DUC, *Dict. Rais. s.v. Sculpture*, p. 272. DE CAUMONT, *Cours*, 8vo., Paris, 1830-43, v, 472. DALY, *Revue Générale*, 1873, xxx, 43. COMMISSION DES MONS. HISTORIQUES, *Archives*. VERGNAUD ROMAGNESI, *Archéologie* (Chambord), 8vo., Orleans, 1836, p. 47. 28.

VIATKA, Wiätka or Wiätzk, originally Khlynof. The capital of the government of the same name; in 1489 the province was annexed to the grand duchy of Moscow, in Russia. It is situated on the Viätka and the Chlenopka; is the see of a bishop; and has two cathedrals and many churches, all of stone; and the monastery of Uspenski Trifonen, founded 1520, which formerly possessed 24,000 serfs. 14. 28.

VIBINUM. The modern BOVINO or Bobino, in Naples.

VIBIUS. A native, was surveyor of works in Sicily under Cicero while consul (B.C. 62-43); he was living at Hipponium (now Vibo) in Lucania, when Cicero fled from Rome to avoid Clodius. PLUTARCH, *Life of Cicero*.

VIBORG. See WIBORG or WYBURG, in Finland.

VIBRATION. An elastic transmission of molecular movement. The consonance of musical notes is dependent on the precise mathematical relations of the vibrations of the instruments which produce them. By the sympathetic communication of vibrations a person with a clear and powerful voice has been able to break a large glass tumbler by singing close to it its proper fundamental note; even twelve large glasses in succession; HERSCHEL, *On Sound*, before 1854. *On Musical Vibrations*, lecture at Musical Institute, May 25, 1853, by prof. Donaldson of Edinburgh, who exhibited a simple process by means of which the number of vibrations corresponding to the natural scale or gamut with the fundamental harmonies, may be seen, heard, and accurately counted. CHLADNI, *Sur l'acoustique*, 8vo., Paris, 1809.

When testing Hailes and Craigleith stones up to 360 lb. per square inch, and after the load had hung for a short time, a slight tap was given to one with a hammer, when it immediately snapped asunder, showing the effect of concussion or vibration when a material is greatly strained, in aiding and completing a fracture; BUCHANAN, *Strength of Materials*, read at Royal Scottish Society of Arts, 1843, and printed in CIVIL ENGINEER, ETC., *Journal*, 1848, xi, 153; which also, xii, 377, describes the *Effect of Vibration on Iron*, read at Institution of Mechanical Engineers; also *On the Oscillation of Chimney Stalks and Lighthouses*, 1850, xiii, 399. REYNAUD, *Mémoire sur l'éclairage, etc., de France*, 4to., Paris, 1864, p. 164, as to lighthouses. 14.

Vibration caused by trains in tunnels, *BUILDER Journal*, 1864, p. 97. BELL CAGE. Vibration injures fine wines placed in a cellar, even to the extent that a 20 to 25 per cent. higher price for cellaring is paid to the London Dock company, in preference to other cellars within the city.

Fall of suspension bridge at Angers, on April 16, 1850, while a regiment of infantry was passing over it. The largest amount of vibration caused by vehicles passing over the temporary bridge at Blackfriars, London, was found to proceed from an empty cab.

VICARAGE. The official house in which the vicar of a parish lives. By way of augmentation to the church of some clerical dignity, he allowed a stipend to a vicar serving the cure. Simple or stipendiary vicars were employed during pleasure; but as the rector often neglected to send an assistant, the vicars were settled for life and hence perpetual vicarages. They generally had the small tithes. The rectors claimed the patronage of the vicarages, whence, after the Reformation, the patron of the rectory claimed the patronage of the vicarage. "Ordination of the Vicarage of S. Dunstan, Canterbury", and endowment; SOMNER, *Canterbury*, fol., 1703, App., 74-5.

VICARS CLOSE. The vicars choral took the place of the canons in ecclesiastical offices, in the choir from the middle of the XII cent. At Kipon, the vicars lived in college, "a fair quadrant of

stone"; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1879, p. 78. At Wells, the most perfect and least altered example, consisted of two rows of twenty-one small houses on either side a long narrow area. The college of vicars choral at Lincoln 1280-1300 is described in ASSOCIATED SOCIETIES, *Reports and Papers*, 1884, p. 235-250. Others at Hereford, Exeter, Chichester, and formerly at S. Paul's, London; SIMPSON, *Chapters in the History of S. Paul's*, 8vo., 1881, p. 259. At Salisbury they lived in houses in the close. At York, the forty-five vicars, in a place called the "Bedern". At Windsor castle, the vicar's new lodgings, founded 1352, were erected 22 Edward IV-Richard III (1482-85).

VICASWARMA. The heavenly architect of the Hindus, had four grandsons, the eldest he made a *shopati* or architect, the second a *satraghi* or measurer; the third a *varhaca* or joiner, and the fourth a *tachhaca* or carpenter; the three last were to be obedient to the first, who had to become instructed in all arts and sciences. VITRUVIUS.

VICE. See ABUSE.

VICE, Vise, Vyce, Vys. See VIS, a spiral or winding stair.

VICE. A CLAMP used in laying boards of a floor (Fr. *tenaille*). Jay's self-acting carpenter's vice; SOCIETY OF ARTS, *Transactions*, 1840, liii, pt. 2, p. 44, 86-7; and *BUILDER Journal*, at end. Also a tool with two cheeks or jaws, that screw up to hold firmly between them any material while being filed or otherwise worked. MOXON, *Mechanick Exercises* (Smithing), 4to., 1677, p. 4-5. A parallel vice is preferable. Garside's registered tube vice for holding wrought-iron and brass tubes with least possible pressure. Kershaw's vice to the planing and shaping machine, 1852.

VICE. A small machine used by glaziers, having two wheels for drawing or milling lead, for making CAMES. JOUSSE, *De l'Art de Charpenterie*, fol., Flèche, 1627, ch. 20. GLAZIER, p. 49.

VICENTE (MATHIEU), architect to the Infant of Portugal, succeeded by E. G. de Sousa, towards end of XVIII cent. He carried out part of the palace of Queluz; and the church and monastery du Cœur de Jesus. He died 1786 in years. CYRILLO, *Memorias relativas as vidas dos pintores*, p. 198.

VICENZA (Lat. Vicentia and Vicetia). A city near Verona, in northern Italy, founded 100 B.C., pillaged by Alaric and Attila, became Lombard, burnt 1236, Venetian 1404 until 1796, and Austrian till 1815. It is situated at the confluence of the river Retrone with the Bacchiglione, crossed by four bridges over the former and five over the latter; that of S. Michele is of one arch 1619 by T. and F., sons of Antonio Pontini, under G. B. Albanese *proto*; another is of the time of Augustus, 20 ft. wide. The walls are dilapidated. Miglioranza 1855 *cir.* traced the plan of a Roman theatre in the piazza S. Giuseppe; a road-way 15 ft. underground, statues, an unfinished Ionic capital with its lines, etc., were found. Near the porta del Consilio or di Castello (STREET) is a tower, originally the March tower between Lombardy and the Venetian states; it is deeply machicolated, and is used as a belfry to an adjoining church. The campanile or torre dell' orologio is 23 ft. square and 270 feet high. The two usual Venetian columns were erected after 1404, on one of which is a new lion *cir.* 1860. At the entrance to the champ de Mars is a triumphal arch (14) called after A. Palladio, to whom a statue was placed 1859 by Gajassi of Rome for conte Bressan. Vicenza is the see of a bishop; and is the city of the architects A. Palladio (1578-1580), of V. Scamozzi (1552-1616), and of O. Calderari (1730-1803).

The cathedral dedicated to the Assumption of the Virgin, dates from 1263-1467; the nave nearly 60 ft. wide, has a broad flight of steps leading to the choir erected 1574; the edifice was much modernised, lastly in 1841; the campanile is XIII cent. on Roman work. CAPPELLETTI, *Chiesi*, x, 819. MAGRINI, *Chiesa Cattedrale di Vic.*, 8vo., 1848. There are nine parish churches. La Sta. Corona, Dominican, Gothic with a wheel window in the brick gable end. Many good tombs; two of the Tiene family

being in armour. High altar is of Florentine mosaic. The campanile is like that of S. Lorenzo. Palladio was 1580 first buried herein. (STREET.) The Dominican church, XIV cent., has romanesque capitals of same date which might be of X cent., a peculiarity of Italian works. S. Stefano. S. Gaetano di Thieni (S. Thienæus) 1721-30, by G. Frigimelica; and attributed to C. G. Guarini, who probably did S. Philip Neri; church and cloister of S. Rocco, 1486; S. Pietro, façade 1597, cloister 1427; oratory of Madonna delle Grazie (10) 1581; S. Vincenzo (4) by G. B. Albanese; San Lorenzo 1481, elegant Gothic, restored *circa* 1877 (STREET), the front has seven high pointed arches, with tombs of XIV cent. A bust of V. Scamozzi (1552-1616) marks his tomb near the entrance. Sta. Maria di Araceli (nunnery) *cir.* 1675, a rotunda with Corinthian columns by C. G. Guarini or Borella. Sta. Maria nuova (34) with Corinthian columns 1594. SS. Filippo e Giacomo, interior 1603. The collegio Cordellino is in suppressed convent of S. Marcello; the former cloister has been surrounded by a handsome double row of colonnades by Malacarne of Vicenza (before 1877). The public cemetery, designed by Malacarne, has a quadrangle with high walls and porticoes of 124 brick arches under which are the vaults. Monument to Palladio by G. de Fabris of Rome, for count Velo, at a cost of 15,000 ducats; and other good tombs; *Diario di Roma*, No. 63 and 64 for 1844. MAGRINI, *Vita et le opere di A. Palladio, pubblicate nell' inaugurazione del suo monumento in Vicenza*, li 19 Agosto 1845, 4to., pl., Padua, 1845.

Some dwellings are in the Venetian Gothic style, pillars forming the mullions in the windows; two balconies; as Pal. del conte Schio end of XV cent. Colleoni Porto (two); one in Contrada Porto, 1481 (STREET); and casa Ant. Pigafetta or Barberrera, 24 ft. wide; completed 1481, a fine specimen; having basement and two floors, architect unknown. The following palazzi were designed by A. Palladio (1518-80): T. Trissino dal Vello d'Oro (9), Corinthian pilasters on arched basement: Valmarana (19), 1566 part completed, large Composite order, a figure at each angle on first floor; with loggia (16 and 17) in the gardens: Chiericati (27 and 28), Doric with inosculating columns at the angles of the centre portion; saloon injured in siege of 1848; purchased by the municipality and restored by Miglioranza; it contains the *museo patrio*, and the collection of drawings by Palladio, Scamozzi, and Calderari; MAGRINI, *Il palazzo del Museo Civico*, 8vo., Vic., 1855: Montan Barbaran, later Luigi Porto Barbaran (22) 1570; Ionic and Corinthian: Conte Porto al Castello, or ca del diavolo (13), large Composite order, perhaps by him; V. Scamozzi disclaimed it; small part executed and now in ruins: Orazio Porto for G. Porto (36), later Colleoni Porto, eight Ionic columns on first floor, still incomplete: Valmarana, later G. de Salvi (24): M. A. Tiene (23) later Franc. e fratelli Tiene, 1556, eleven windows between small composite pilasters on rustic basement, now the *dogana*: "Casa di Palladio" (26) but erected 1569 by P. Cagolo for his own use: Pioveni now Porto Godi: P. Caldagno 1575 (35): he also restored the pal. Schio (32) 1556, now Franceschini: and Annibale Tiene (18), by conte M. A. Tiene, a friend of Palladio's, 1549, was added to by V. Scamozzi; corinthian and composite, incomplete.

Casa Freschi now Pizzoni, 1561 by G. D. Scamozzi. Nievo now Godi, 1569 by V. Scamozzi. Franc. Trissino, later Ott. Trento now Branzo Lorschi, at the duomo, 1577 (20) by V. Scamozzi, perhaps his best work; a range of nine windows; Fabbrica Monti (25) 1581, having a middle window à la Palladio; and M. A. Trissino (21) in the corso 1592, completed 1662 by O. Calderari; who designed pal. Cordellina, 1775, now the *comunale college*; 1772 the casino in the Pallamajo for S. A. Sola; 1773 the pal. Bonini (Thiene) in strada di porta nuova; 1782 pal. Loschi in the corso; 1785 casino for A. Todaro; and the fabbrica Capra on the corso.

The palazzo della Ragione, or basilica (1), an old Gothic building, 72 ft. wide, burnt 1389 and erected by 1444: in 1496-8 G. and Z. Spavento, G. Romano (Pippi), and A. Riccio were consulted on the loggia and council house. It was faced

1545-9 with an arcaded loggia of two stories, designed and superintended by A. Palladio, his first work in the city. ARNALDI, *Delle Basiliche*, 4to., 1767, 1769. FORMENTON, *Basilica*, 8vo., Vic., 1870. *Illustrations*, 1854-5, pt. 2, pl. 123, s. v. Basilica. The scala terrena on south side is by G. B. Albanese. The palazzo del comune adjoining it, partly by V. Scamozzi, is now the municipal offices. The palazzo *Capitanale*, now *prefetizio* (2), large Composite order, by A. Palladio but not carried out by him although *fecit* is cut on the narrow return façade (3) after a triumphal arch (now a dwelling). The teatro Olimpico (29-32), behind a block of houses, was after the design of A. Palladio, begun 23rd May 1580 and carried on by his son Scylla; the text of Vitruvius was followed; PALLADIO, *Opere*. FALKNER, *Classical Museum*, 8vo., 1851-2. MORELLI, *Imola*, fol., Rome, 1780. MAGRINI, *Il teatro Olimpico*, 8vo., 1847. MONTENARI, *Del teatro Olimpico*, 8vo., 1733, 1749, 1773. BUILDER *Journal*, 1863, xxi, 881. In the collection of drawings at Chiswick, belonging to the duke of Devonshire, is one of the scene by G. B. Albanese with his signature. The south loggia of the monte di pietà 1619 by G. B. Albanese. The ospizio de' poveri is annexed to the church of S. Pietro. Gateways, porte del giardino Porto (11 and 12). A good arcading of renaissance work in the garden of the bishop's palace, only given in the "A. A. Notes", 8vo., 1887-8, p. 161.

About three-quarters of a mile is Monte Berico, having a sanctuary erected 1420-28 upon it, joined to the city by a continued range of arcading 730 yards long; the arch (5) to the steps is attributed to Palladio; its church (now the transept) is dedicated to Sta. Maria del Monte Berico, Gothic; a large part was added 1688 by Barella, making a Greek cross: it contains the "Supper of pope Gregory the Great" by Paolo Veronese. At the foot is the villa "La rotonda" (6, 7, 8) designed for marchesi Capra, by A. Palladio; it was occupied by the Austrians 1848 and much damaged. Near it is the villa Valmarana consisting of three separate casinos; in the large gardens is an orangery eleven score paces long (EVELYN, described in LOUDON, *Encyc. of Gardening*, 8vo., 1850, § 96. The Palazzo Trissino in Cricoli (33) 1530 was the residence of G. G. Trissino, the poet, he or Palladio designed it, an early work. The palazzo Volpi has a splendid staircase. Casino del Franc. Tornieri (15).

PAGLIARINO, *Croniche di Vic.*, 1663. FACCIOLE, *Museum Lapidarium Vic.*, 1776. ANTOLINI, *Il tempio di Minerva in Assisi*, etc., 4to., 1803. ARNALDI, *Idea d'un teatro*, etc., 4to., 1762; 1786; MOSCA, *Descrizione dell' A. P. S. di Vicenza*, 4to., 1779. ARUNDAL, *Specimens of the Edifices of Palladio*, fol., London, 1833. MARZARI, *La historia di Vic.*, 4to., 1594; 1604. SCAMOZZI, *L'Origine dell' Accad. Olym.*, 8vo., 1790; 12mo., Vic., 1822. COSTA, *Delle delizie del fiume Brenta*, fol., 1750. *Il Forastiere istruito nelle cose più rare di Architettura di Vicenza*, 8vo., Vic., 1753; 1761; 1780; 1804, attributed to Scamozzi, 36 architectural plates to which the figures in the text apply. MAGRINI, *Dell' Archit. in Vic.*, 8vo., Padua, 1845, contains a list of the buildings in the city and province arranged chronologically.

WOODS, *Letters*, 4to., 1828. ROSE, *Letters*. WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 257. The published works of PALLADIO, SCAMOZZI, and CALDERARI. ROSCOE, *Landscape Annual*. CAPPELLETTI, *Chiese d'Italia*, x, 819. BUILDER *Journal*, 1858, xvi, 856. 26. 28. 50. 96.

VICENZA (GIOVANNI DI); see SCAMOZZI (G.).

VICENZI (ANTONIO) or di Vincenzo, with fra A. MANFREDI, called A. da Faenza, were 26 February 1390 deputed to superintend the church of S. Petronio, at Bologna. VASARI, *Lives*, 1850, i, 46, states maestro Harduin (? Arduino of Bologna) as the designer. 94.

VICH. A city in Catalonia in Spain, situated on the river Ter. The Roman town was razed by the Moors and rebuilt 798; a temple with its cella almost intact is built into the centre of a mediæval house. It is the see of a bishop. The

cathedral dedicated to S. Peter, was badly restored at the end of xviii cent.; its cloisters dating from xiv cent., have been rebuilt. Four other churches, three monasteries, a bishop's palace, and other buildings, are noticed. 28. 96.

VICI (ANDREA), born 1744 at Arcevia in the Marca d'Ancona, studied at Perugia, and under S. Pozzi and C. Murena at Rome. Vanvitelli engaged him as assistant on the mola di Pontano. In 1780 the court of Tuscany appointed him hydraulic architect and engineer for the Val di Chiana, and 1787 was employed to drain the Pontine marshes. In 1810 he erected the *maraglione* or embankment at Tivoli to support the left bank of river Anio. He designed the church and monastery delle Salesiane at Offagna; the seminary at Osimo; the large villa and casini at Monte Gallo; the palazzo Lepri at Bevagna; the church of S. Francesco at Foligno; many small altars in the church at Loreto; the capella Gozzoli at Terni; and after the earthquake of 1799 "la superba cattedrale di Camarino". He died 10 September 1817. TIPALDO, *Biog. degli Ital. Illustri*, 8vo., 1837, iv, 36. FOLCHI, *Vita*, 8vo., Rome, 1836. 14.

VICTORIA REGIA HOUSE. A hot-house or aquarium, designed specially for this large plant, by J. Paxton, at Chatsworth, for the duke of Devonshire. The plans, etc., of it were first given in the GARDENER'S CHRONICLE; also in SOCIETY OF ARTS *Journal*, 13 Nov. 1850; CIVIL ENGINEER, etc., *Journal*, xiii, 324-5; and ARCHITECT *Journal* for Oct. 5, 1850, ii, 471-2, in which it is stated that it was the type for the building for the Exhibition of the Industry of All Nations of 1851. At Sion, for the duchess of Northumberland, cost £700 to begin with. Botanic gardens at Kew; and in Regent's Park. Knight and Perry's at Chelsea is detailed in WEALE, *Handbook to London*, 8vo., 1851, 1854, p. (534).

VICTORIA STONE. A material patented 1868. It is composed of granite chippings and Portland cement cast in moulds and steeped in a solution of silica to become non-porous, of a hard and durable character, and equal in colour to Portland stone. In 1877 it was advertised that the moulds were then lined with metal so that the stone could be turned when worn, both sides being equally fair. For paving, the three ordinary sizes are 3 ft. by 2 ft.; 2 ft. 6 ins. by 2 ft.; and 2 ft. square. It is suitable for troughs, sinks, cisterns, copings, caps, window and door-sills, landings, steps of any shape and size. A beam 9 ft. long and 4 ins. square was made. The paving and channel stones used in the areas of S. Thomas's hospital, London. It forms a capital paving, and a considerable saving has been effected by using it in lieu of rubbed York. The paving in the Poultry and Blackfriars bridge is standing the test of traffic well; CLUTTON, *S. Thomas's Hospital*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1870-71, p. 68. The crushing weight per cubic inch was given in 1878 as 6,441 lbs., as against 7,770 Aberdeen granite; 5,616 Yorkshire landing; 4,032 Stafford blue brick; 2,620 Portland stone; 1,657 red machine brick; 1,244 Bath stone. In 1887 Victoria stone was put at 8,321 lbs. BUILDING NEWS *Journal*, 1870, xviii, 456, 482; xix, 14, 50, 68. In 1887, August, the footways of London bridge were paved with this material; a specimen of which, laid in 1869, was to be seen on the south-east approach to Blackfriars bridge, and is apparently as good as when first laid, while the adjacent York stone put down at same time was renewed some years ago. As compared with 3 in. York stone there is said to be a saving of 10 to 15 per cent. in cost, besides its durability. It imbibes very little water.

VICTORY. An emblematic female figure often seen represented in ancient works, on coins and works of art, called *Nike* by the Greeks, and *Victoria* by the Romans: the daughter of Pallas. As the personification of victory she is usually represented with wings, and as in the act of flying, carries a wreath or palm branch, is engaged in raising a trophy, or inscribing the name of the victory of the conqueror on a shield, or with conquering heroes whose horses she guides. A figure is shown on the throne in the usual representations of the statue of

Jupiter Olympius by Phidias, and another standing in the hand of that deity. The Temple on the Palatine at Rome was one of the most venerable relics of ante-Roman Rome. On the arches of triumph of the Romans, Victory is represented as drawn by or driving two horses; on the Antonine column as ascending to heaven with her hero in a car drawn by four horses. Winged Victories are placed over the centre arch of the arch *civ.* A.D. 204, to Septimius Severus at Rome. An altar and statue in the Curia Julia were placed there with a trophy of Egyptian spoils by Augustus; the statue brought from Tarentum was highly valued. The two Victories which sustain the arms of Clement XII, in the saloon in the museum of the Capitol at Rome, were taken from the arch of Marcus Aurelius (270-5) in the Corso. A bronze figure, larger than life, of Greek workmanship, the gem of the museum at Brescia, is drawn by Horsley, in *ROY. INST. OF BRIT. ARCHITECTS, Transactions*, 1888, p. 143. The famous statue by Pæonius of Mende, at Olympia, was disinterred during the German excavations; it is now in the local museum, and a cast of it is in the British museum; NEWTON, *Essays*, 8vo., 1840. Among modern works are those on the porte S. Denis, the Carrousel arch, etc., at Paris. 25.

VICTORY; TEMPLE TO. The little Ionic temple called Nike apteros on the south side of the ascent to the acropolis, at Athens, said to be of the time of Cimon (B.C. 489-449; or before 432), was demolished 1687 by the Turks; the fragments discovered 1835 by Ross who with SCHAUBERT wrote *Die Akropolis*, fol., 1839; and was restored 1844 by him; *ATHENÆUM Journal*, April 21, 1844; DALY, *Revue Générale*, v, 286; viii, 13; xvi, 145; *ARCHITECT Journal*, 1850, ii, 401; *ALLGEMEINE BAUZEITUNG*, 1855, pl. 723-8; BRULÉ, *Acropole d'Athènes*, 8vo., 1853; new edit., 1868; and HARRISON, *Mythology*, etc., 8vo., 1890. DONALDSON, *Temple à la Victoire, monument commémoratif à Messine*, 4to., Paris, 1876.

VICTORY; ARCH OF. See TRIUMPHAL ARCH.

VICTORY; TOWER AND PILLAR OF. At Chillorgarh Meywar, Rajputana, by ... 6 pl., fol., Calcutta, 1883. The tower, a *Jaya Stambha*, erected at Chittore by Khumbo Rana, reigned 1418 to 1468, of the Mewar dynasty, to commemorate his victory over Mahmud of Malwa in 1439. It is 9 storeys high, 30 ft. wide at the base, and 120 ft. high, with stairs, the whole elaborately ornamented; FEIGUSSON, *Indian, etc., Arch.*, 8vo., 1876, p. 253, who states that a dome was added since he sketched the tower in 1839. Also his *History*, p. 424. SIMPSON, in *ROY. INST. OF BRITISH ARCHITECTS, Transactions*, 1889, p. 64. A Moslem tower of Victory at Gour, in Bengal, 84 ft. 6 ins. high, with stairs; DANIELL, *Views*, 4to., 1805; CREIGHTON, *Ruins*, 4to., 1817; RAVENSHAW, *Ruins*, 40 photos., fol.

VIDAL (SEBASTIAN), 1653, maestro mayor at the cathedral at Cordoba finished the tabernacle of the retablo mayor. 66.

VIDAÑA (...), of Castille, was held in much esteem; 1544-46 he went with A. Covarrubias to design the celebrated Hieronymite church and monastery of S. Miguel de los reyes, at Valencia. (VALENCIA.) He is perhaps the JUAN DE VIDAÑA or Vidania who 1531 designed the *obispado* at Cuenca. 66.

VIDIMUS. A PATTERN to be followed in executing stained glass. "Good and true patrons otherwise called 'A vidimus', for to fourme glasse and make by other four wyndowes"; contract for glazing windows in King's College chapel, 18 Henry VIII, 1526; WILLIS AND CLARK, *Cambridge*, 4to., 1886, i, 616; but it may mean, the form of the opening for the London glazier SYMONDES, to work to; the sight measure. 19.

VIEL (CHARLES FRANÇOIS), also known as Viel de S. Maux, born 21 June 1745 at Paris, was a pupil of Chalgrin; gained several prizes at the academy, and was appointed inspector of the college of France, and of the towers of S. Sulpice. In 1780 he designed the halle au blé at Corbeil; (NORMAND, *Paris Moderne*, 4to., Paris, 1843, pt. 2, pl. 79.) About 1780 he was appointed architect to the hospitals of Paris, and designed the enlargement of the hôpital de la Salpêtrière, de Bicêtre, des Enfants trouvés, parvis Notre Dame; 1780-2 the hospice de

S. Jacques du Haut Pas, or faubourg S. Jacques, later Cochon (HUSSON, 16); 1781 the hospice de Larochevoucauld, at Montrouge; where 1823 he was succeeded by J. J. M. Huvé (NORMAND, ii, pl. 101-2; GOURLIER and others, *Choix*, etc., fol., Paris, 1825-50, iii, pl. 40); 1786 buildings of the mont de Piété in the rue Paradis; 1792-1802 new wards to the hôpital de la Pitié, facing the jardin des plantes (HUSSON, pl. 5); the palais de la pharmacie centrale; the large amphitheatre of the hôtel Dieu, and of the maternity; the great sewer with the baths and prisons de Bicêtre; 1791 the tribune of the organ in the church S. Jacques du Haut Pas; the chief door of the maison des Sourds-Muets rue S. Jacques; the ferme de Villènes, dite de Marolles, near Poissy; that of Villeblin near Melun; the perron of the château de Bellegarde; and the shops, in passage des Petits pères (pl. 39), passages des Panoramas (pl. 40), and No. 42 rue neuve Vivienne (pl. 41 of THIOLLET ET ROUX, *Nouveau recueil de menuiserie*, fol., Paris, 1837). With Desjardins he designed maisons rue Hauteville, No. 21 and 23, in CALLIAT, *Parallèle des Maisons*, fol., Paris, 1850, i, pl. 73-80. He died 1 December 1819 at Paris. LANCE, *Dict. Biog. Life*, in *Annales des Arts*, 3rd ser., 1820, v; and publications in *Journal de la librairie*.

He published some remarkable works. *Projet d'un Monument consacré à l'Histoire Naturelle*, 4to., 1779, 1780. *Lettres sur l'Architecture des Anciens et sur celle des Modernes*, 8vo., 1781-87. *Principes de l'ordonnance et de la construction des Bâtimens*, 4to., 1797; 1814. *Observations philos. sur l'usage d'exposer les ouvrages de peinture et de sculpture*, 8vo., 1788. *Moyens pour la restauration des piliers du dôme du Panthéon*, 4to., 1797 and 1812. *Décadence de l'Architecture à la fin du XVIII^e siècle*, 4to., 1800. *De la Construction des édifices publics sans l'emploi de fer*, etc., 4to., 1803. *Des Anciennes études de l'Architecture*, 4to., 1807; 1809. *Plans, etc., du projet de restauration*, etc., 4to., an. VI, 1798. *Des points d'appui indirects dans la construction des bâtimens*, 4to., 1802. *Impuissance de Mathématiques pour assurer la solidité des bâtimens et recherches sur la Construction des Ponts* 4to., 1805. *De la solidité des Bâtimens—de l'impossibilité de la restauration des piliers—sur le plan exécuté par Soufflot*, 4to., 1806, reported on by F. A. Davy de Chavigné, 1806. *Des erreurs publiées—faute par Soufflot*, etc., 4to., 1806. *Notice Biog. sur O. A. Bridan, statuaire*, 4to., 1807. *Notice Nécro. sur F. A. Davy de Chavigné*, 4to., 1807. *Inconvénients de la communication des Plans avant leur exécution—Construction de la voûte de la Salle de vente de la succursale du Mont de Piété; plans, etc.*, 4to., 1813. *Notice Nécro. sur J. F. T. Chalgrin*, 8vo., 1814. *De la chute imminente de la Science de la Const. des bâtimens en France*, 2 vols., 4to., 1819. 68, 110, 113.

VIEN (JEAN MARIE VICTOR), born Dec. 31, 1796, at Paris. In 1853 he designed for the Champs Elysées the palais de l'industrie for the exposition universelle of 1855, and published a work upon it, fol., 1857. He was architect to the prefecture of police, and a member of the conseil de salubrité. He died March 7, 1863, at Paris.

VIENNA. See WIEN, the capital of Austria.

VIENNA BLUE; see THENARD'S BLUE: GREEN; see SCHEEL'S GREEN: WHITE; see KREM'S WHITE.

VIENNE (Lat. Vienna Allobrogum; Ital. Vienna). A town in the department Isère, Dauphiné, France, situated on the river Rhône, crossed by a stone bridge and a suspension bridge near which is the tower called tour de Mauconseil built by Philip de Valois as a tête du pont to the stone bridge destroyed 1651, upon the site of the tower from which, traditionally, Pilate threw himself off. As one of the most ancient towns in France, there are numerous Roman remains; as Mont Pipet once a fortified camp, prætorium or temple to Augustus and Livia, also known as *Notre Dame de la Vie*, and similar to the Maison Carrée at Nîmes, 40 ft. by 60 ft. by 44 ft. high, walled in between the columns at a late date; it is now a museum of antiquities: ruins of the porticoes of the forum or of a theatre; an archway or gateway of good style, also called *tour d'Orange*, nearly 50 ft. high and 22 ft. span: walls on the bank of the river

Gère; a pyramidal ruin called *plan de l'aiguille* and tomb of Pontius Pilate near the town, 45 ft. or 65 ft. high, perhaps the *spina* of a circus; a *via* or road; part of an aqueduct and water conduits; a mosaic pavement 20 ft. by 25 ft. discovered about the end of 1859 (*BUILDER Journal*, xviii, 96); also of an amphitheatre nearly 850 ft. long and 400 ft. wide; a theatre; and of a temple 450 ft. long, of Parian (?) marble. Vienne was the see of a bishop.

The cathedral is dedicated to S. Maurice. The choir dates 1245; MOYEN AGE PITTORESQUE, pl. 149, gives details of columns: no transepts; the façade xv and xvi cents. has two towers, it suffered damage 1562 and later. The tomb on which appear two PEACOCKS is noticed s. v. To the south is the chapel of S. Theodore having a good doorway. The pulpit was designed 1834 by Pollet (POLLET ET ROUX, *Mons. d'Arch.*, fol., Paris, 1841, pl. 20). The church built 1152 by G. Martin, and cloister in a private garden, of the abbey of S. André le Bas; the fine Romanesque tower is like those of Ravenna; the flying buttresses of xii cent. are perhaps the earliest known. The abbey church of S. Pierre is now a museum; it is a late Roman wide hall of v cent. divided later into nave and aisles; a Romanesque tower of xii cent., and with chapel of Notre Dame; a white marble seat behind the altar for the abbot: church of S. Severe; a former Jesuits' college of good style; and the college and church of S. André le haut. *ARCHAEOLOGIA*, 1794, xi, 329, 334. A house in rue des Orfèvres is partly renaissance; public library, burnt 1854: the town-hall has a handsome modern front; a good modern theatre, and cavalry barracks. POWNALL, *Notices*, 4to., 1788, p. 146-53. PULLAN AND TEXIER, *Byzantine Arch.*, fol., 1864, p. 103, pl. 14, the temple; and LA BORDE, *Monuments de France*, fol., Paris, 1816-36, pl. 40-1. TAYLOR ET NODIE, *Voyage dans l'Ancienne France* (Dauphiné), fol., gives many plates. REY AND VIETTY, *Monuments Romains et Gothiques*, fol., Paris, 1820; 1831. *BUILDING NEWS Journal*, 1859, v, 953. DALY, *Revue Générale*, ii, 227, 230-1; x, and xxiii; which, xiv, pl. 40, gives a fanal de cimetière at Château-larcher. 14. 25. 28. 50. 96.

VIESTI (Lat. Apeneste), from (?) a temple there to Vesta. A town in the province of Capitanata, Naples, on the borders of the Adriatic and now a seaport. Ancient walls, a strong castle, a cathedral dedicated to the Assumption of the Virgin; and three other churches, etc., are mentioned. GIULIANI, *Mem. Stor.*, etc., della città di V., 4to., Naples, 1768. 28. 50. 96.

VIETOLI (...), 1650 designed La vigna della regina, near Turin, for cardinal Maurice of Savoy, now used as school for daughters of military officers.

VIEW (Fr. *vue*). It is a matter of nicety to determine the spot from whence a spectator should view the object, whether by approaches, roads, or walks, and the exact distance at which he should be permitted to obtain a full view. There is a certain point of distance from whence every object appears at its greatest magnitude. The apparent height of any object will vary according to its distance, the inclination it makes with the horizon, and the relative elevation or depression of the spectator. Examples are given in LOUDON, *Encycl. of Gardening*, 8vo., 1850, p. 472-4. The point of view of the Parthenon is explained in PENNETHORNE, *Geometry and Optics of Ancient Arch.*, fol., 1878. Prof. Cockerell held that two-and-a-half times the height of the building is the best distance from the object. LIGHT AND AIR (p. 81).

VIFQUAIN (JEAN BAPTISTE), born 24 June 1789 at Tournai, designed the hôpital at Tirlémont; the new prison, the buildings around the great theatre, and the port Guillaume, at Bruxelles. As ingénieur en chef he carried out the canal d'Antoing at Mons, and the canal from Bruxelles to Charleroi; GOETGHEBUER, *Monuments des Pays Bas*, Ghent, 1827, p. xii. He was living in 1840, and wrote three works on canals.

VIGARANI (GASPARE), not Vigarini as sometimes written, of Modena, was called to Paris by Louis XIV, *cir.* 1670 to design the salles des machines or theatre at the Tuileries; BLONDEL,

Architecture Française, fol., Paris, 1752-56, iv, 89, pl. 27-30: and *cir.* 1673, the new salle de spectacle, in le jeu de paume du Bel Air, rue de Vaugirard, near the Luxembourg; AICARD, *Patria*, etc., 8vo., Paris, 1847, p. 2134. He published *Regole sicure e geometriche per fare le Fortezze, con un trattato di Chivromanzia*. 5. 93.

VIGARNY (FELIPE DE); Vigarini, Viguerni, Viguernis (el maestro Felipe); also el maestro F. de Borgoña, Burgugne, and Philipp de Borgognone and Bourgoyne, from his father. A native of Burgos, worked under Juan de Colonia or of Cologne, and became, *cir.* 1500, the most celebrated architect and sculptor of Castile, the successful rival of Torregiano. The cardinal Cisneros Ximenes 1502 called him to Toledo to execute the high altar at the cathedral; 1510-25 he executed the large retablo of the capella real at Granada, wherein is the tomb of Ferdinand and Isabella, on which his pupils worked, creating a new school; 1529-31 he was at the cathedral at Salamanca; and at the retablo in alabaster; also the great retablo of the capella des Reyes nuevas, executed by F. de Comontes. He then left to rebuild the four pillars at the transepts and the *cimborio* or dome (a fine Gothic-renaissance work completed 1567, and on which J. de Castañeda and J. de Vallejo were employed as masters) of Burgos cathedral which had fallen down 3 March 1539; and about 1536 he carved the choir screen. Then returning to Toledo he with A. Berruguete, each carved thirty-five of the high stalls of the choir of the cathedral, those of his being on the gospel or left or north side of the church. In 1539 he was engaged at Segovia. He raised a school of artists in Spain, had a number of pupils, and died 10 November 1542 or 1543, at Toledo, where near the altar of Nuestra Señora de la Descension, was the inscription beginning "Philippus Burgundio statuarius". LANCE, *Diet. Biog.*, 1872, from DUSSEUX, *Artistes Franc.*, 8vo., Paris, 1856, p. 217, lxiii. 66.

VIGEVARO. A town in Novara, in Italy, situated on the river Ticino. The large castle of the Sforza family was 1492 altered by Bramante, afterwards a palace and more recently a barrack, adding "li novi edifici" of CESARIANO, *Vitruvius*, fol., Como, 1521, p. 113b. The cathedral dedicated to S. Ambrogio of Milan, placed in a good piazza surrounded by porticoes, was 1829 greatly renovated. There are two other parish churches, S. Dionisio, and S. Cristoforo; and near the town the large church 1495 of Sta. Maria della Misericordia; also good cavalry barracks and a handsome college with a granite façade. 28. 50. 96.

VIGILLE. The modern BISCEGLIA, or Biseglia, in Naples.

VIGNETTE; Vinette (Fr. *vigne*). A running ornament in imitation of the tendrils and foliage of a vine, carved in hollow moldings, especially during the Decorated and Perpendicular periods.

Capital letters in ancient MSS. were formerly called *vinicolae*, *viticolae*, or *vignettes* (DU CANGE, *vincolis*) in consequence of their being frequently ornamented with flourishes, in the manner of vine-branches or shoots. Then it was applied to any large ornament at the top of a page. In xvii century, all sorts of printer's ornaments were generally so called. Lately it was applied to small illustrations without a definite border. RABELAIS uses the word to denote certain ornaments of goldsmith's work on the scabbard of a sword. In LYDGATE, *Book of Troye*, 1513, it may denote sculptured foliage at the sides of a window:

"And yf I shulde rehersen by and by
The corve knots by craft of masoury,
The fresh embowing with verges right as lynes,
And the housyng full of bachewines,
The ryche coynyng, the lusty tablemens,
Vinettes running in casementes."

"Vinettes and trailes of sauage worke," 19 Henry VIII; HALL, *The Union*, etc., 4to., 1548.

VIGNOLA. See BAROZZI (G.), born in the town of Vignola, 1507, and died 1573.

VIGNON (PIERRE), designed a temple to Victory now the church of La Madeleine at Paris, ordered by Napoleon I to be constructed utilising the materials of the church designed by Contant d'Ivry, 1764 for Louis XV, altered by Couture, and the work, suspended by the revolution, was renewed in 1806 when Vignon was instructed by Napoleon I; he was assisted by J. J. M. Huvé from 1808, first as sub-inspector, then inspector, and in 1828 succeeding Vignon as architect he felt bound to follow the designs; it was completed 1843; GOURLIER, *Choix, etc.*, fol., Paris, 1825-50, ii, pl. 296-7, 301-2. Vignon died 1 May 1828. DALY, *Revue Générale*, xii, 1853, p. 42.

VIGNORY. In the département of Haute Marne, in France. The small church founded 986, perhaps a very unique example, was restored by Bœswillwald; its disposition is "anti-catholique". COMMISSION DES MONUMENTS HISTORIQUES, *Archives*, DALY, *Revue Générale*, 4to., Paris, 1852, x, 247, pl. 11 and 12; xiv, 24.

VIGNUOLO (il); see MARAZZI (J.).

VIGNY (... de), made the designs for the new palace of the ambassador of France, at Pera, constructed by R. de Cotte. 1723 he was a member of the academy of architecture at Paris, and resigned 1758. His cabinet was sold 1773. DUSSEUX, *Artistes Franç.*, 8vo., Paris, 1856, p. 245.

VIGONO (IANNINUS DE), ingenarius, vir est perspicacis ingenii in gubernatione et opere instrumenti bellici, quod vulgo "Briccola" nominatur, etc.; a letter from La signoria di Firenze to Lodovico principe d'Achaia, 27 Oct. 1406; GAYE, *Carteggio*, 8vo., Flor., 1839, i, 86.

VIHARA; also called "sangharamas", and "gonpa" in Tibet. The monastery of the Buddhists; the CHAITYA being the temple; BUDDHA. Generally there are three or four, or more viharas to each chaitya, and often the vihara exists alone, without any chaitya cave in the series, though the converse is perhaps never the case. FERGUSSON, *Indian, etc., Architecture*, 8vo., 1876, refers to the monasteries at Nalanda, Sultangunge, and Sarnath; western caves at Nassick, Ajunta, Karli, and Ellora. A chaitya cave in midst, at Bagh, very interesting. KITTOE, *Viharas and Chaityas of Behar*, 8vo., Calcutta, 1847. SIMPSON, *Buddhist Architecture*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1879-80, p. 44.

VIJAYANAGAR. A village in the Madras presidency, properly called Hampi, on the river Tungabhadra. The ruins all of great interest, of the old city destroyed 1565, cover nine square miles and include several fine temples, one to Vitoba, stables for elephants, an arena for wild-beast combats, the remains of a zenana or harem, and some large monolithic statues, one 35 ft. in height. Near the arena is a trough hewn from one stone 41 ft. long; and in one of the temples a sculpture of an elephant and car 30 ft. high; all dating between 1508 and 1542. HUNTER, *Imp. Gazetteer of India*, 8vo., 1887, xiii. FERGUSSON, *Indian, etc., Arch.*, 8vo., 1876, p. 374.

VILARD; see HONNECORT (W. DE).

VILIGELMUS da Modena, sculptor of the bas-reliefs and statues on the exterior of the duomo at Modena. See VERONA (GUILIELMO DA). CICOGNARA, *Scultura*, fol., Venice, 1813, i, 312.

VILLA (It. *casino, villa, vigna*; Arab. *zigarr*, a place of trees; Sp. *egarra, cigarrale* near Toledo; Fr. *maison de campagne*; or *de plaisance, château, bastide* near Marseilles; Ger. *land haus, lust haus*; the Sp. *villa* is *town*). A country house; its site ought to be agreeable, commodious, and healthy; with winter and summer apartments, if so extensive; surrounded by trees to yield a refreshing air and shade during the summer, and to break the rough cold winds of winter. COTTAGE. FERME ORNÉE. RURAL RESIDENCE. The "villa rustica" of PARKER, of 1864. "A villa" at Boulogne-sur-mer, by Manguin, is given in DALY, *Revue Générale*, 4to., Paris, 1867, xxv, 155, pl. 39-43, who disputes the title and names it "a cottage for a gentleman". The "villa reale" at Naples is an alameda, not a dwelling.

There are important advantages in designing a villa, which deserve to be brought into notice, whether for comfort and convenience, for gratifying taste or fashion. Rooms appropriated to new purposes are often requisite. Formerly a gallery, although there were no works of art to fill it, was a necessary part of a mansion; of late years, the billiard-room and the conservatory enter into the arrangements of a villa by an architect; and a suite of well-planned nursery-rooms have been made an essential part of the plan of a country mansion. The gallery or corridor may again resume its importance, and perhaps, like the Romans, covered walks contiguous to the house may be adopted to enjoy fresh air and exercise in the many rainy and snowy days at a country residence in an English winter. The irregular style admits of such additions, and loses nothing of the picturesque effect. The exterior decorations of terraces, parterres, steps of communication between differing levels, and various gardens filled with groups of the many flowery shrubs and plants, are admirably in harmony with this style of architecture. This irregular architecture does not require the expensive labour on its masonry as is bestowed on a Grecian or Roman mansion; the whole may be in rubble work, excepting the parapets, cornices, jambs of windows, and doors. If circular or square towers are introduced in such a composition, they should be of large dimensions, as much for their being adapted for useful rooms, as to produce grandeur of effect on the exterior.

The country seats of the Italians were in the XVII and XVIII centuries, celebrated by poets, visited and admired by travellers, and copied by the architects of the civilised nations of Europe. They are so arranged as to produce the best effects, while advantage of the nature of the site has been taken with great skill. The regularities of the gardens accompany the decoration and support the architecture.

The following publications, ranged chronologically, afford a summary of the taste of the several nations, exclusive of the *Journals* of the CIVIL ENGINEER, ETC., from 1837; the *BUILDER* from 1843; the *BUILDING NEWS* from 1856; the *ARCHITECT* from 1869; and the *BRITISH ARCHITECT* from 1874; besides the many foreign publications of a similar character. LEWIS, *Villas, Mansions, etc.*, fol., 1780. SOANE, *Cottages and Villas* fol., 1783, 1793. MIDDLETON, *Cottages, Farm Houses, etc.*, fol., 1795. RICHARDSON, *Country Seats*, fol., 1795. PLAW, *Rural Architecture*, 4to., 1796; *Ferme Ornée*, 4to., 1795; and *Country Houses, Villas, etc.*, 4to., 1800. LUGAR, various books, 1805, 1807. LOUDON, *Mansions and Cottages, etc.*, 2 vols., 4to., 1806. AIKIN, *Designs for V. and other Rural Buildings*, 4to., 1808. BUSBY, *Designs for Villas and Country Houses*, 4to., 1808. ROBINSON, *Rural Architecture*, 96 pl., 4to., 1823; *New Designs for Villas*, 56 pl., 4to., 1838. JACKSON, *Designs for Villas*, 4to., 1829. WETTEN, *Italian Villas*, 4to., 1830. TRENDALL, *Designs for Cottages and Villas*, 30 pl., 4to., 1831. PAPWORTH, *Rural Residences*, 8vo., 1832, 27 pl. THOMSON, *Retreats*, 41 pl., 4to., 1833. LOUDON, *Encyc. of Cottage, Farm, and Villa Arch.*, 8vo., 1833-42. JONES, *Athenian or Grecian Villas*, fol., 1835. BREES, *Rural Architecture, Italian Villas*, fol., 1843. FOX, *The Country House*, 4to., 1843. SCRATTON, *Country Houses*, fol., 1844. WALTER AND SMITH, *Cottage and Villa Architecture*, 6 vols., 4to., 1846. PATTISON, *Cottages, Villas, etc.*, fol., 1847. BROOKS, *City, Town, and Country Architecture*, 36 pl., fol., 1847. KENDALL, *Modern Cottage and Villa Arch.*, Three Series, 4to., 1849-56. GOODWIN, *Domestic Architecture*, 4to., 97 pl., 1850. DOWNING, *Arch. of Country Houses*, 8vo., New York, 1851; and *Cottage Residences*, 8vo., 1852; 1873. RHODES, *Villas, etc.*, 4to., 1854. VAUX, *Villas and Cottages*, 300 eng., 8vo., New York, 1857; 1863. HEMMING, *Designs for Villas, Parsonages*, 4to., 1859. WICKES, *Handybook of Villa Architecture*, Two Series, 30 pl. each, 4to., 1859-62. PARKER, *Villa Rustica*, 4to., 72 pl., 1864. *Grammar of House Planning*, 12mo., 1864. STARFORTH, *Villa Residences and Farm Arch.*, 4to., 1865. BOGUE, *Domestic Architecture*, 20 pl., 4to., 1865. DEAN AND YEOMAN, *Selected Designs for Country Residences*, 4to., 1867. WOODWARD, *Country Houses*, 136 cuts,

12mo., New York, 1866. BLACKBURN, *Suburban and Rural Architecture*, 4to., 1868. ROGERS, *English Mansions, Villas, etc.*, 24 pl., fol., 1866. (BLACKIE), *Villa and Cottage Architecture*, 4to., 1869. WILKINSON, *English Country Houses*, 4to., Oxford, 1870; 1875. RICHARDSON, *Pict. Designs for Villas, Mansions, and Lodges*, 8vo., 1870. BIRCH, *Examples of Labourers' Cottages*, 8vo., 1871; and *Country Architecture*, 4to., 1874. YOUNG, *Pict. Architectural Studies*, 50 pl., 1872. LASCELLES, *Country Residences*, fol., 1878 and 1882. KERSHAW, *Famous Kentish Houses*, 8vo., 1880. AUDSLEY, *Cottage, Lodge, and Villa Arch.*, 85 pl., fol. (? 1880).

Roman.—The country houses of the Romans, at Naples, *cir.* 476, are described by GIBBON, *Decline, etc.*, 8vo., edit. 1854, iv. 101. CASTELL, *Villas of the Ancients*, fol., 1728. The various villas of the emperors, as Hadrian's, Caesar's, Gordian's, Pompey's, Pliny's, and others;—are described in various works; many are named in BURN, *Rome and the Campagna*, 4to., Cambridge, 1871-6. Q. DE QUINCY, *Dict. d'Arch.*, gives the letter of Pliny to Gallus, and that to Apollinarius. DEZOBRY, *Rome au siècle d'Auguste*, 4th edit., 8vo., Paris, 1875, iii, 299; and iv, 210.

Roman villa in England; its transition into the later manor; SEEBOHM, *English Village Community*, 8vo., 1884, p. 263. GODWIN, *The English Archaeologist's Handbook*, 8vo., 1867. Northleigh, disinterred 1813-16, about 200 ft. square, the latest coin discovered was of Arcadius, died 408; HAKEWILL, *Account*, 4to., 1826; and in SKELTON, *Oxfordshire*, 4to., 1836. Abinger, Surrey; discovered 1878; ARCHITECT *Journal*, 5 January, and BRITISH ARCHEOLOGICAL ASSOCIATION.

Roman in Belgium; SCHAYES, *Arch. en Belgique*, 12mo., Brux., 1850-53.

Italian.—Villa Capra near Vicenza. COSTA, *Delizie del fiume Brenta*, 140 pl., fol., Venice, 1750-6. SCHUETT, *Recueil d'Architecture en Italie*, fol., 1821. DALRÉ, *Maisons de Plaisance—de l'état de Milan*, fol., 1737. PERCIER, *Célèbres Maisons de Plaisance de Rome*, fol., Paris, 1809. BOUCHET ET ROCHETTE, *La villa Pia, etc.*, fol., Paris, 1837.

G. DE PRANCEY, *Architecture des Arabes*, 8vo., Paris, 1841, p. 128. *German*.—GRAMM, *Der Architekt für Freunde der schönen Baukunst*, 26 pl. of country residences with details, fol., Frankfurt, 1854. CHATEAUNEUF, *Architectura Domestica*, 19 pl., 4to., 1839. SCHINKEL, *Palast Orianda in der Krömen*, fol., Berlin.

France.—KRAFFT, *Maisons de Campagne*, 292 pl., fol., Paris (1802). KRAFFT, *Recueil d'Architecture Civile*, 121 pl., fol., Paris, 1812. PETIT, *Maisons de Campagne*, *Arch. Pitt.*, 1855. VIOLETT-LE-DUC, *Dict. Raisonné, s. v. Villa*, 275-313. ROGUET, *Choix de Châteaux, Maisons de France, etc.*, 4to., 1858. BLONDEL, *Distribution des Maisons de Plaisance*, 4to., Paris, 1737-38. BRISEUX, *Art de Bâtir les Maisons de Campagne*, 4to., Paris, 1743. COINTÉREUX, *Ecole d'Architecture Rurale*, 8vo., Paris, 1790-91. PICTON, *French Suburban Villas*, 8vo., 1870; and BUILDING NEWS *Journal*, 1870, xix, 113, 131; derived from DALY, *Arch. privée sous Napoléon III*, fol., Paris.

VILLA (PIETRO DELLA), employed 17 Dec. 1391 on the duomo at Milan; FRANCHETTI, *Milano*, 4to., Milan, 1821; and GIULINI, *Memorie*, 4to., Milan, 1760-71, xii, 448.

VILLA BOA, or VILLA BOA DE GOYAZ. The capital of the province of the same name in Brazil. The cathedral dedicated to S. Anne; houses of mud or earth, governor's palace, court-house, hospital. 50.

VILLACASTIN (fra ANTONIO DE), of the order of S. Geronimo, 1557 arranged the lodging and cell at the monastery of Yuste for the emperor Charles V; was 1574 chief superintendent of the works at the Escorial, where he was buried with the title *hujus regie fabricæ prefectus—obiit nonagenarius iv die Martij anno 1603*. 66.

VILLAFRANCA (LUIS DE), of Andalusia, 1541 consulted on the design for the hospital La Sangre, at Seville, founded 1545 by P. Machuca. In 1590 he with five other architects declared in favour of covering the church with a roof of timber, but it is arched with stone. SEVILLA, p. 62b. 66.

VILLAGE. Numerous circumstances have contributed to lead to the building of cottages near each other. There is a variety in the disposition of such buildings in old villages which has been justly admired by lovers of picturesque beauty. Artificial villages have too often been formed on very different manners, a result so stiff and formal as to be entirely destructive of picturesque effect, without exciting any idea sufficient to compensate the want of it. WEAVER, *Cottage Architecture*, 10 pl., fol., 1848; 1850. SEEBOHM, *English Village Community*, 8vo., 1884. Edensor, near Chatsworth, for duke of Sutherland, with its church, by sir G. G. Scott, Somersleyton, Norfolk, for sir S. M. Peto, ILLUSTRATED LONDON NEWS, January 10, 1857, xxx, 24. Akroydon, Copley, West Hill Park, Halifax, etc., in HOLE, *Homes of the Working Classes*, 20 pl., 8vo., 1866. Bedford Park, Chiswick, see *Journals* for 1875, etc. Thorney village 1850 for the duke of Bedford; some cottages by S. S. Teulon; ROBERTS, *Cottages on the Bedford Estate*, fol., 1849.

VILLAGE HOSPITAL.—at Cranley, BUILDER *Journal*, 1861, xix, 804. At Ditchingham, Norfolk, by R. J. Withers, in ARCHITECT *Journal*, 3rd August 1872, viii, p. 62. The *Journals* for later years.

VILLALPANDO (FRANCISCO DE). A native of Valladolid in Spain. In 1540 he was employed on the carved work at the *regas* of the *coro* of the capilla mayor, and on two desks, at the cathedral at Toledo; which have been ascribed to A. Beruguete and to F. de Vigaray, as were also the fine outside bronze doors 1545 of the fachada de los Leones in the same building (Door, metal); Villalpando undertook the work for 6,000 ducats, and was assisted by Ray Diaz del Corral by whom they were completed. In 1545 he went to Seville with G. de Vega, Morales, and others to select a site for the hospital La Sangre. In 1553 worked at the alcazar at Toledo on the principal staircases and other works, being succeeded by his brother-in-law G. de Vega, all was done before 1567. With him also, he 1559 designed part of the church of the Minims, in the same city. He wrote or translated *Tercero y quarto libro de Arquitectura de Seb. Serlio*, fol., Toledo, 1563; and died in 1561. 66. 88.

VILLALPANDO (JUAN BAUTISTA), a Jesuit, born in 1552, at Cordova, a clever architect, completed H. PRADO, *Templi Hierosolymitani comment. et imag. illust.*, 3 vols., fol., Rome, 1596-1606. He died 22 May 1608, aged 56. 68. 113.

VILLA NEUVA, in Mexico. Near this town, in the states of Zacatecas, are "Las ruinas de l'hacienda la Quemada"; plan and views in NEBEL, *Voyage Pitt. du Mexique*, fol., Paris, 1836.

VILLANUEVA (don JUAN DE), born September 15, 1739, at Madrid, son of Juan a sculptor. In 1756 and 1757 he obtained prizes at the academy; 1758 studied at Rome with his brother DIEGO; 1765 returned to Madrid; 1767 was employed at real Sitio; 1768 designed a house at the Escorial for the French consul; another for the marquess de Campovillar; and being appointed architect to the king, he designed streets, squares, houses, theatres, and palaces for the infants don Antonio and don Gabriele (MILIZIA); and to the Escorial itself, he about 1773 made considerable alterations to the entrance, vestibule, and staircase on the north side. 1781 he designed the entrance to the botanic garden at Madrid; the campo santo outside the puerta di Fuencarral; and the observatorio astronomico for Charles III (1756-88); 1785 the royal *muséo* (ruined but repaired 1819-21 by Ferdinand VII (1808-33) for a picture gallery; added the peristyle to the casa del ayuntamiento of XVI cent.; and 1790 the portion burnt 16 August on the south side of the plaza mayor. He was appointed director of the royal academy of S. Fernando. His taste was founded on the best Italian works. He died in 1809. 66. 68.

VILLANUEVA (don DIEGO), brother of JUAN, and visited Rome with him. 1756 director of the royal academy of S. Fernando; was engaged with G. B. Sacchetti in the design for the new palace at Madrid; and redecorated before 1774 the interior

of the church of the convent of Descalzas reales. He made a translation of *Vignola*; and died in 1785. 66. 68.

VILLARD de Honnecourt; see HONECORT (WILARS DE).

VILLA REAL, and VILLA VICIOSA (CIUDAD DE); see LLANOS (SAN CRISTOVAL DE LOS).

VILLAREAL (JOSEF DE). 1645 aparejador and ayudante de trazador mayor of the alcazar at Madrid, was on the death of A. Carbonel, 26 Sept. 1660, appointed maestro mayor; and 22 April 1657 began the chapel of S. Isidro in the parish church of S. Andrés at Madrid, designed by Diego de Madrid. 66.

VILLAVICIOSA. The capital of the district, of the same name in Spain. In the church of Sta. Maria are a rose-window at west end, and a clearstory, very remarkable. The collegiate church and Hieronymite monastery, with its cloister, were designed 1389 by R. Alonso or Alfonso. The Iglesias de S. Salvador or *Val de Dios*, near the town, was founded by the Benedictines; the church which is perfect, was consecrated 893. Near it is the church of S. Salvador de Priesca, Romanesque, completed 1218; both are represented in *Monumentos Arquitectonicos de España*, fol., Madrid, 1859-86. 28. 66.

VILLEDIO (MICHEL), was 1639 called "architecte des batiments royaux et maître général des œuvres de maçonnerie"; 1649 had built many houses in the new quartier de la Butte S. Roch, notably in the street bearing his name. His son FRANÇOIS had the same title, and when 17 Oct. 1665 Louis XIV laid the first stone of the colonnade of the Louvre, he presented to him "le manteau d'honneur". He was living in 1673. LANCE, *Dict. Biog.*, 1872.

VILLENA. A town of Valencia in Spain, situated on the river Vinalopé. The ruined castle is a grand object. The tortuous streets have ancient family mansions with armorial decorations. The spacious town hall has a prison and granary attached. The iglesia arcedianal de Santiago, 1498-1511, has curious spirally fluted columns; FERGUSSON, *History*, 8vo., 1865-7, ii, 275; it is represented in *Monumentos Arquitectonicos de España*, fol., Madrid, 1859-86. 28. 50.

VILLENEUVE (... DE), was 1728 admitted a member of the academy of architecture at Paris, and died 1730.

VILLERS (JACQUES LOUIS FRANÇOIS), of Angers, was born 7 February 1791 at Paris, and became a pupil of Delespine. He designed at Cholet, the hôtel de ville and the tribunal du commerce, with a public fountain; the palais de justice at Saumur; at S. Florent le Vieil, a column in memory of the *passage* of the duchess of Angoulême in 1823; at Chemissé, the hall with mairie and court of justice; a church, hospital, and presbytery for the commune de Champvée; and alterations and additions for the museum at Angers, to which town he was appointed architect. 68. 110.

VILLERS (MAXIMILIEN), probably the son of Max. Villers, architecte-expert-Bourgeois, at S. Martin du Parc (Eure), where the son 1779 was born; became a pupil of Percier, and gained 1793 or 1795 the second grand prix of 6,000 fr. in the national competition for a temple to Liberty. He restored, and laid out the gardens at the château de Mont Huché near Longjumeau, for general Desolles; the same at the château de Bandeville near Dourdan; designed the park at the château de Bruyères le Châtel, which has been partly restored; the gardens and embellishments of the château de Villeneuve, for the duchess d'Angoulême, and for her the stabling in the rues de l'Université et de Bourbon, at Paris. 68. 110.

VILLOT (JEAN). He studied in Paris, and settled at Strassburg, where in 1810 he continued the theatre, begun 1804 by the engineer Rabin but given up on account of structural defects, making a new design which was accepted. He also designed the fruit market, and other works, with 1827 the *mehlhalle* or corn exchange; ALLGEMEINE BAUZEITUNG, 1837, pl. 148. He died in 1844. 68.

VILNA. The capital of the government of the same name in Russia, situated on the rivers Vilja and Wileyka. It was founded at the beginning of xiv cent., and became the capital

of the ancient Lithuania united to Poland in 1386. On a hill are the ruins of the immense palace or castle of the Jagellon family. There are many palaces of the nobility. The large hospital is in a park which had belonged to the prince Sapieha. The Russo-Greek cathedral, dedicated to S. Stanislaus, was built 1367-87; the façade was designed by a "Rossi of Rome" assisted or carried out by the Polish architect Skuczewicz; in a marble chapel is the silver shrine of S. Casimir. The church of the Assumption was built 1364, and there are about forty other churches, with Protestant, Roman Catholic, and Greek churches, a mosque for the Tatars, and several synagogues and monasteries. The fine town hall by the Polish architect Gucwicz; the government house formerly the episcopal palace; the post-office in the palace of cardinal Radziwill; the Jesuit college founded 1578, used 1773-1803 as the university, suppressed 1832 and its library of about 200,000 volumes sent to Kief and S. Petersburg; a museum of antiquities; an observatory; and arsenal. SCHNITZLER, *La Russie, etc. Voyages de la Commission Scientifique du Nord*. 14. 28. 50.

VIMANA; or shrine or temple proper, of the Hindus of Southern India. It consists of the garbhagriha or sanctuary—generally called dewal or bara, or bura dewal (dewul warra = place of temples), and also called vimana; the pyramidal part is called SIKRA or surra. In front of the sanctuary is generally an ANTARALA, or porch, also called MANTAPA, bogha mandap, munduf, or muntapum, which is called arda mantapa, if there be also a detached CHAORI or choultry or hall, which is the maha (big) mantapa; FERGUSSON, *Rock Cut Temples*, fol., Lond., 1845, p. 8. The *vimana* is always square, pyramidal and has a domical or bulbous termination. The basement is of granite, and contains a cubical apartment (always), the shrine for the god. The upper part is usually of solid brick, plastered with chunam, and although in many cases 1,000 years old, is as sharp and perfect as when first erected. The decoration, story above story, is a repetition of miniature shrines, displaying sometimes, on each face of the *vimana*, from 500 to 1,000 statues; FERGUSSON. A *vimana* from RAM RAZ, *Arch. of the Hindus*, 4to., London, 1834, is copied in BATISSIER, *Histoire de l'Art Monumentale*, 8vo., Paris, 1845. FREEMAN, *History of Architecture*, 8vo., 1849, p. 57.

VINA (PEDRO); see VINYA (P.).

VINA (FRANCISCO DE LA), 1582-7 constructed the new *fuerza* and other works at the town (*villa*) of Gijón, in Spain. 66.

VINAGE (...), was a member of the academy of architecture at Paris, in 1730, and died (?) 1735.

VINBOONS (P.); see VINGBOONS (P.).

VINCENT (Saint). The bridge over the river Moselle was built 1752 by E. Heré de Corny, of Nancy.

VINCENT (...), of Laon, 1611 was directed to restore, for Louis XIII, the middle vaulting of the portal of the cathedral at Reims; TARBÉ, *N. D. de Reims*, 8vo., Reims, 1852, 2nd edit.

VINCENT (JACQUES), maître des œuvres du roi, is mentioned in a letter of about August 1334 of Philippe de Valois, permitting the Blancs Manteaux of Paris to open a door in the city wall. LORINEAU, *Hist. de Paris*, iii, 8vo., Paris, 1725; in LANCE, *Dict. Biog.*, 8vo., Paris, 1872.

VINCENT (AMBOISE MÉRY), born September 1776, at Paris, was a pupil of Levasseur; he obtained ten medals at the école royal at Paris; and was appointed inspector of the buildings of l'Élysée Bourbon and La Malmaison; controller of the buildings of the Crown at Compiègne; inspecteur of the hospices civils at Paris; architecte expert du cadastre; and the cour royale et le tribunal de commerce of the same city. His son Aristide Henri was born 1804 at Brest. 68. 110.

VINCENZ. In 1460 perhaps to 1499 he was the *werkmeister* at the cathedral at COLMAR or Kolmer, in France.

VINCENZO (ANTONIO DI); see VICENZO (A.).

VINCI (LEONARDO DA), also a celebrated sculptor and painter, born 1443 (MILIZIA) or 1452 (VASARI), in the castello di Vinci,

in the lower Val d'Arno, near Florence; was son of Ser Piero da Vinci, notary to the signoria. He became a pupil of A. del Verrocchio.⁹ About 1464 at Milan, the church of Sta. Maria della Grazie and monastery are attributed to him and to Bramante; in the refectory is his celebrated fresco of the Last Supper. For Ludovico Sforza, il Moro, duke of Milan, he conducted the waters of the river Adda to that city; and formed the canal of Mortesana, near the valleys of Chiavenna and Valtellina, to be navigable for over 200 miles. In 1483 he wrote a letter to Ludovico il Moro (given in AMORETTI) detailing his inventions, and in par. 10 writes, "I can prepare designs for buildings, whether public or private, and also conduct water from place to place" (VASARI, *Lives*, 8vo., 1851, ii, 394). At Florence, he proposed to raise the church of S. Giovanni (the battistero), putting steps up to it; the high altar of the Annunziata is attributed to him and to Alberti. Between 1504-15 he went through certain districts as architect to Valentino Borgia, to inspect the fortresses: and 1502 to Cesare Borgia, captain general of the pope's army. In 1510 March he was consulted on the works at Milan cathedral. His architectural sketches comprise:—Plans for towns; for canals in towns, castles and villas, palaces; constructing domes, on plans of Greek cross, circular base, square base, from pillars, Latin cross; church for preaching; mausoleum; central tower, *tiburio* of Milan cathedral; lifting the battistero; palace architecture, and studies of detail. Theory of fissures in walls, niches; nature of the arch, foundations, resistance of beams (p. 25-99); remarks on the style of Leonardo's architecture (p. 100-4). These are given in RICHTER, *Literary Works of L. da Vinci*, 2 vols., 4to., London, 1883, arranged from the MS. B., in Institut de France at Paris; Vallardi volume in the Louvre; Royal Library at Windsor Castle; Tribulzi MS. at Milan; Codex Atlanticus at Milan; Ashburnham MS. 2; South Kensington Museum, MS. 2 and 3; Manzoni MS. at Rome; and Arundel MS. in British Museum. Among his pupils were his nephew the painter Pierino da Vinci, called il Vinci, and F. Melzi who was also his executor. He died not 1518 (MILIZIA) on his way to Francis Ist.: but 2nd May 1519 (VASARI), aged 66, at as now ascertained, his house at Cloux, near Amboise. His place of burial is unknown. A monument about 37 ft. high to him was placed 1874 in the piazza della Scala at Milan, having on the angles of the pedestal statues of four most distinguished pupils, G. A. Beltraffio, A. Salaino, M. d'Oggiono, and C. da Sesto, with a colossal statue of Leonardo, by P. Magni, all of Carrara marble on a plinth of red Baveno granite. AMORETTI, *Memorie Storiche L. da V.*, 8vo., 1804. LOMAZZO, *Arte de la Pittura*, etc., 4to., 1584, transl. by R. H(aydocke), fol., Oxford, 1598. *Treatise on Painting, with Life*, 8vo., 1721. J. W. BROWN, *Life*, 8vo., 1828, from MSS., etc. 14.

VINCULA. "Pro v dos magnorum vinculorum ferri prec. dos 3s. 4d. et v dos vinculorum minimorum prec. dos 9d., iij dos. hespes", etc., 1472, probably iron hinges and clasps for the windows; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durham, 1859, p. 78, 359.

VINCULUM. A bond, band, cord, fetter, gyve, or tie. A prison.

VINE BLACK. Carbon of vine tendrils and twigs, which contain tartar. Carbonized husks of grapes, *tryginon*, invented by Polygnotus of Thasos, about B.C. 463.

VINEGAR. A dilute acetic acid obtained by vinous fermentation. In England it is usually procured from malt; in France from poor wine. Wood vinegar, or pyroligneous acid, prevents putrefaction, and this crude acid is applied to timber both to prevent the dry rot and the ravages of insects. It was used in working the Purbeck marble shafts at Lincoln cathedral, "et solidum forti fenetratur aceto," 1186-1200; DIMOCK, *Metrical Life of S. Hugh*, 1860, p. 38; in GENTLEMAN'S MAGAZINE, 1860, ix, 463; and is still used for the same purpose in some Belgian marble works. The word *aceto* used by LIVY is translated "vinegar", but is probably the Latin *acheto*, or

pickaxe; or *acuto*, iron nail or wedge; but PLINY, *N.H.*, xxxiii, shows that fire and vinegar were commonly used in the mines of Spain, for breaking flints; NOTES AND QUERIES *Journal*, 4th Ser., ii, 289, 490, 543.

VINE LEAF, tendrils and grapes were worked in the Samian ware of the Romans, as late as II and III centuries: in the spandrels of Aveline's tomb in Westminster abbey, of the Decorated period: and the leaves and fruit are seen carved in Henry VII's chapel of the Perpendicular period, during which it was usually used in decoration.

VINERY. A glazed erection under which a vine is trained to produce grapes. CONSERVATORY. RIVERS, *Amateur's Fruit Garden*, 12mo., 1862, p. 34, suggests that 8 ins. is too near the glass for plants; 12 ins. is better: and p. 101, that 21 oz. glass should be used, 16 oz. being too slight for sloping lights. The angle of 45 may be fixed on as the fittest average for the slope of the roof; it was adopted by MILLER, both in culinary and ornamental hothouses, and is fitter for general purposes than any other, says LOUDON, *Encycl. of Gardening*, § 5115, although he had previously acknowledged (§ 2048) the "fortunate discovery of the late sir G. Mackenzie in 1815" that the form of glass roofs best calculated for the admission of the sun's rays is a hemispherical figure; and although his illustrations are earlier in date than the introduction of "ridge and furrow roofing", they show an almost upright front to a very narrow house as the best form for houses in which vines, peaches, cherries, or figs are to be grown. The underground portion of the walls against which the trees are trained is usually pierced with small arched openings, for the roots or vine to stretch through to or from the moist soil outside—a rough paving being laid inside, at about 2 ft. below the surface, to obstruct the progress of the roots downwards. RIVERS, shows a simple ground vinery, which about 1865 was greatly improved upon and patented by Wells of Southend, as "the portable folding ground vinery". "The barless ground vinery" in 14 ft. lengths, was advertised 1867.

VINETTES; see VIGNETTE.

VINE WOOD. Fragments of the old entrance door to the duomo at Ravenna are of this wood, of which the original slips were 13 ft. long and nearly 2½ (ins.?) wide probably imported from Constantinople (*Handbook*); or 11 ft. and 2 ins.

VINGBOONS (JOST), perhaps son of David, of Amsterdam, designed many works there and in other towns. In 1604 he appears from an engraving to have designed the house for heeren Louysen Herdric Trip, called "Trippenhuys", which became the picture or national gallery, at Amsterdam. 68.

VINGBOONS (PHILIPPUS), brother or son of JOST, became city architect, designed several large houses in the Franco-Dutch style; many of which are engraved in his *Gronden en Afbeeldsels*, etc., fol., Amst., 1648, 1665, 1674, 1680 and 1688; also *t' Boeck der Gebouwen*, fol., 1667, 1674, 1688: these were republished as *Gronden*, etc., or *Oeuvres d'Architecture*, 2 vols., fol., Leyden, 1715; 1717; La Haye, 1736. The first plates are 1662 two houses for Louis and Henri Trip, having the name of "Just V., inv." The remainder with "P. V. inv." are here placed in order of date. 1649 house for M. F. van der Schalde; 1650 N. van Bambeek; J. and H. Schuyt; 1654 J. von Ysselmuyden, near Vollenhove; 1655 Pierre de Mayer; Remond de Smit, at Utrecht; 1656 N. van Heuvel at Diepenheim; 1660 four houses for J. Kromhant on the new land called Heere Gracht, by Huyde straat; Joseph Deuts, south of the Heere Gracht; 1661 G. Marcello, da Zingel or Konings Gracht; 1663 B. van der Bargh at Harsvelt; N. and N. Burchaerts brothers, rue le Grim, Hamburg; 1663 C. Gerards, on Heere Gracht; 1664 G. Belin la Garde, near the Heere Gracht; La maison de Vanenburg, in the Velaw, near Harderwyk and Nieuwerkerk, for H. van Essen; 1665-6 J. J. Nijs, on Keyzers Gracht; 1669 château for Jean Clant van Stedum, at Steem near Groningue; 1669 H. de Haase, seigneur de Stabroeck, south of Heere Gracht; G. van den Broeck at Nieuwersluis;

a mansion calle, aet Keyserrijch, west of Heere Gracht, for G. Onia; and three designs. 68.

VINYA or Viña (PEDRO), maestro mayor to the municipality of Valencia, of much esteem, was engaged 1482 and 1500 on hydraulic works and surveys of public buildings. In 1486 the marble pavement in the cathedral was carried out by him and P. Compte or Conde. 66.

VINYES (JUAN BAPTISTA), of Valencia, 5 Oct. 1688 designed the tower of the parish church of Sta. Cruz in that city, finished in 1705. 66.

VIOLA (LEONE BAPTISTA), is quoted in LANGLEY, *Ancient Masonry*, fol., 1736, p. 247, pl. 87, perhaps in error.

VIOLA ZANINI (G.); see ZANINI (G. V.)

VIOLET. One of the compound hues, being composed of red and blue.

VIOLET-COLOURED MARBLE. See PAVONAZZO; and BRECCIA.

VIOLET WOOD. See KING WOOD.

VIOLET-LE-DUC (EUGÈNE EMMANUEL), born 27 January 1814 at Paris, a pupil of A. F. R. Leclère; 1836-7 visited Italy, Sicily, and much studied the south of France. In 1840 he was appointed inspector of works at the Sainte Chapelle at Paris, with Duban and Lassus. Begun 1840 the restoration of the church of the Benedictine abbey at Vézelay. Then followed—S. Pierre, Montreale (Yonne); the archbishop's palace at Narbonne, now the hôtel de ville, part of which was rebuilt in the style of xv cent.; the churches at Poissy, at Semur; and the Romanesque church of S. Nazaire, with 1849 the ramparts of the cité of Carcassonne, being the most perfect example of the system of military defence in Europe from xi to xiv cent. 1845 with Lassus at the cathedral of Notre Dame at Paris, where he succeeded F. Debret. 1846 appointed architect to the abbey of S. Denis. 1846-52 pulled down the western towers set angleways of S. Ouen at Rouen, and rebuilt them square with the façade. 1853 restored N. D. de Châlons sur Marne: 1859-72 the château de Pierrefonds: 1860 *cir.* protestant cathedral at Lausanne; 1859-72 the château d'Eu, near Noyon, for the comte de Paris, cost £200,000: 1860 the officialité at Sens, erected 1245 with the *salle synodale*: 1869-74 at the cathedral at Clermont, two bays of the nave and two towers and principal façade, in style of end of xiii century, completed from the top of the nave by de Baudot: 1870 *cir.* the donjon tower of the château 1205 at Rouen, which had been destroyed 1590. He designed the church of S. Nicholas at Nantes, and that at Belleville; the maison rue de Berlin; hôtel de M. Durand, avenue de Neuilly; and maison rue de Douai; all in CALLIAT, *Maisons de Paris*, fol., Paris, 1850-64, i, pl. 120-46; ii, 38-41, 59-62. In 1870 at the siege of Paris he organised an auxiliary corps of engineers and was actively engaged on the defence works. In 1874 he gave up his appointments keeping only that of S. Denis.

His publications are as follows:—*Album de Sainte Therdosie*, 4to., Paris, 1854. *Dictionnaire Raisonné de l'Architecture Française du XI au XVI siècle*, 10 vols., 8vo., 1853-68. *Lettres adressées d'Allemagne à M. Lance*, 8vo., 1856. *Description du Château de Coucy*, 8vo., 1857, 2nd edit., 1861. *Dictionnaire Raisonné du Mobilier Français*, 6 vols., 8vo., 1858-75, transl. by M. MACDERMOTT, 8vo., Oxford, 1860; 1879. *La cité de Carcassonne (Aude)*, 8vo., 1858. *Essai sur l'Architecture Militaire au Moyen Age*, 8vo., 1854; transl. with *Notes on English Castles* by HARTSHORNE, 8vo., 1859. *Lettres sur la Sicile*, 8vo., 1860. *Entretiens sur l'Architecture*, 3 vols., 8vo., 1858-63-72; plates 4to.; transl. by BUCKNALL, 8vo., London, 1877-81. *Intervention de l'état dans l'enseignement des Beaux-Arts*, 8vo., 1864. *Réponse à M. Vitet à propos de l'enseignement des Arts du dessin*, 8vo., 1864. *Matériel des travaux du génie civil et de l'Arch.*, 8vo., 1868. *What Architectural Education means in XIX century*, 8vo., 1869. *Description et Hist. du Château de Pierrefonds*, 8vo., 1857; 7th edit., 1874; 12th, 1886. *Mémoire sur la défense de Paris*, Sept. 1870-Jan. 1871, 8vo., and pl.

4to., Brux., 1871; Paris, 1871. *Histoire d'une Maison*, 18mo. (1873) and (1883); transl. by BUCKNALL, 8vo., 1874; 1876. *On Restoration; and Notice of his Works*, 8vo., transl. by WETHERED, 8vo., London, 1875. *Histoire d'une Forteresse*, 8vo. (1874); transl. by BUCKNALL, 8vo., London, 1875. *Histoire de l'habitation humaine, depuis les temps préhistoriques jusqu'à nos jours*, 8vo. (1875), transl. by BUCKNALL, 8vo., 1876. *La fortification passagère dans les guerres actuelles*, 8vo., 1875. *L'Art Russe, ses Origines, etc.*, 8vo., 1877. *Le Massif du Mont Blanc; Etude sur sa Const. Géodésique, etc.*, and *Carte*, 8vo., 1876; transl. by BUCKNALL, 8vo., 1877. *Monographie de l'église abbatiale de Vézelay*, fol., 1856; 1873. *Histoire d'un Dessinateur*, 8vo., 1879. *Histoire d'un Hôtel de Ville et d'une Cathédrale*, 8vo. (1879). *Comment on devient Dessinateur*, 8vo. (1883). *Brochures Diverses*, 8vo., 1856-80. *Modèles de dessin*, 100 feuilles sur 72, Temple Grec, Thermes d'A. Caracalla, etc.

With Denis and CHARNAY, *Cités et Ruines Américaines*, 8vo. and fol., 1862-63. With OURADOU, *Chapelles de N. D. de Paris, peintures murales, exécutées sur les cartons de V. le Duc*, 62 pl., fol., 1868-70. With NARJOUX, *Habitations modernes recueillies par V. le Duc*, 200 pl., fol., 1874-5. *Gazette des Architectes et du Bâtiment*, 4to., 1863. With GUILHERMY, *Description de Notre Dame de Paris*, 8vo., Paris, 1856. With LASSUS, *Monographie de N. D. de Paris et de la nouvelle sacristie*, lar. fol., 1853-54. With MACÉ, *La France avant les Francs*, 4to. (1882).

He died 17th September 1879, aged 65, at Lausanne, suddenly of apoplexy. BUILDER *Journal*, 1879, xxxvii, 1068, 1073, 1097, 1313. The *Gazette des Architectes*, etc., of 5 Oct. 1879 gives notices and a list of his published works. WETHERED, *The late E. E. Viollet-le-Duc*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1883-84, p. 210-17: and *A further Sketch of his Life and Works*, 1888, iv, new Ser., p. 62-76. SAINT-PAUL, *V. le Duc; ses travaux d'art et son système archéologique*, 8vo., 1881. General index to DALY, *Revue Générale*, which 1852-3, x and xi, contains his *Essai sur l'origine et les développements de l'art de Bâtir en France, depuis la chute de l'empire romain jusqu'au XVI siècle. Compositions et Dessins publiés sous le patronage du comité de l'œuvre de maître*, 100 helios, fol., Paris, 1884.

VIPSANIUS AGRIPPA (MARCUS), born 63 B.C., son of Lucius Agrippa, was of an obscure family; but became the son-in-law of Augustus. About 37 he transformed the Lucrine lake, near Baie, into a safe harbour, which he called the Julian port, for practising the navy, and on a victory received a naval crown, the first or second one conferred. In 33 he expended immense sums on great public works. He restored the Appian, Marican, and Anienian aqueducts, and constructed a new one fifteen miles long from the Tepula to Rome, called the Julian, with a large number of smaller waterworks for distributing the water. He had the cloaca of Tarquinius Priscus cleansed. His various works were adorned with statues by the first artists of Rome. In 27 during his third consulship he added several other works including the *thermae*, considered to be the first large ones in Rome, with the portico, to the domed structure designated the Pantheon, which portico is inscribed M. AGRIPPA L. F. COS TERTIUM FECIT; five steps formerly led up to it. Whether he built the Pantheon or incorporated that edifice with his works, and only added the portico, or whether the Pantheon was rebuilt later, is still doubtful (DION. CASS., xlix, 43; liii, 27; PLINY (died 79 A.D.), *N. H.*, xxxiv, 19; xxxv, 10; xxxvi, 4; "the pantheon of Agrippa has been decorated by Diogenes of Athens" (probably the statue in the Braccio Nuovo brought from the palazzo Paganica, near the Pantheon, was one of these), and xxxvi, 64; MARTIAL (43-104 A.D.), xx, 36, and x, 87, mentions baths and portico only; STRABO, v, 235; FRONTINUS, *De Aqueductibus*, 9. SERLIO, *Arch.*, 15. In 19 Agrippa went into Gaul, constructed four great public roads and the splendid aqueduct at Nemausus or Nîmes. He died in March, 12 B.C. suddenly, in Campania, aged 50, and was buried in the mausoleum of Augustus, in Rome. DURUY, *Histoire des Romains*,

iii and iv, 8vo., 1886. NISPI LANDI, *Marco Agrippa e i suoi tempi, etc.*, fol., Rome, 1883, cap. 5 notes, considers the architect of the Pantheon to have been Lucius Cocceius Auctus, who built for Agrippa the round temple to Augustus, at Pozzuoli, now dedicated to S. Proculo. 59.

VIQUE, a town in Spain. The cathedral dedicated to . . . ; the columns in the cloister were 1325 carved by B. PORTELL, lapicida, of Gerona. 66.

VIRADHUREL, 1390, the *silpi* (architect), who was learned in the works of *silpa sastra* (architecture), erected the temple at Mynal or Mahanal, in MEWAR. TOD, *Annals of Rajasthan*, 4to., 1829, ii, 235, 748.

VIRBERIUS *me fecit*, is inscribed on the portal of S. Benoît sur Loire. LEBEUF, *Recueil*, 12mo., Paris, 1738, ii, 140. RAMÉE, *Histoire d'Architecture*, 8vo., Paris, 1843, ii, 135.

VIRGA. This term for a measure of length "is always incorrectly translated *yard* instead of *pole*"; LONGMAN, *S. Paul's*, 8vo., 1873, p. 28, 30.

VIRGATE, was the normal holding of the *villanus*; SEEBORH, *English Village Community*, 8vo., London, 1884, p. 101, which (p. 27) he states was from thirty to forty acres. A *vista* was a half-hide of land or two virgates of about thirty acres each. A *great vista* was four virgates or one hide of land of about 120 acres (p. 51). A *solanda*, *sullung*, or *solin* was a double hide of land or about 240 acres (p. 54). CAMBRIDGE ANTIQUARIAN SOCIETY, read Oct. 20, 1884, by O. C. PELL. *ARCHÆOLOGIA*, xlvii, 97-98. *HIDE*, or *Yard land*. WARA.

VIRGINAL ORDER. The Corinthian order is called *Gracile e Virginal*, by SCAMOZZI, *Architettura*, fol., Venice, 1615, lib. vi, cap. 10, p. 33; as stated in CHAMBERS, *Civil Architecture*, s. v., "Orders in general."

VIRGIN TINT, or primary colour. Also the various mixtures of hues and colours with white and shades, are called tints.

VIRLOYS (CHARLES FRANÇOIS ROLAND LE), was born 2nd October 1716 at Paris. A plan of "Le Quesnoy 1744" in the King's library at the British Museum, is signed "Le Virloys direct". He 1751 gained in the competition for a theatre at Metz, which is given in his elaborate *Dictionnaire d'Architecture, Civile, Militaire, etc.*, with terms in six languages, 100 pl., 3 vols., 4to., Paris, 1770-71. He was architect to the king of Prussia and to Maria Theresa. He died 30 May 1772.

VIRTUE or VIRTUS; TEMPLE TO. This goddess had several at Rome with representations of her, and the figure is common on medals of the emperors. In BARTOLI, *Admiranda Romanorum*, fol., Rome, 1683, the figure called the genius of Rome is that of Virtue, as where she is giving the globe to Marcus Aurelius; guiding the chariot of Titus; and conducting Hadrian home; on these she is dressed as an amazon; sometimes in a coat of mail, or a short vest with legs bare; a manly face and air; and generally grasps a sword. A temple at Rome was designed about 104 B.C. by C. MUTIUS, architect (VITRUVIUS, iii, 1), near the trophies of Marius; the ruins near S. Eusebius are supposed to be the remains. It was perhaps erected by Marcellus (B.C. 222-208), and in it the senate passed the decree recalling Cicero (B.C. 55). The temple to Honour and Virtue, at Rome, rebuilt by the emperor Vespasian (69-79 A.D.), was embellished by the painters Cornelius Pinus, Thallus, and Attius Priscus; PLINY, *N. H.*, xxxv, 10, 37. BURN, *Rome and the Campagna*, 4to., Cambridge, 1871-6. 3. 68.

VIS, or VICE. A screw. The French term for a spiral staircase (circular winding staircase, noel or newel stairs, turnpike stairs), the steps of which wind round a perpendicular shaft or pillar, called the spindle or newel, the shaft being often formed by the end of each step one over the other; this shaft is called "the vise" by some writers. It is found used in English as vice, vic, vys, vicz, vise, viz—as in CHAUCER; BRITTON, *Westminster Palace*, 8vo., 1836, 121, 165, 168 of 1319-52. In a projecting building attached to the archbishop's fort at Coblenz, is one of the finest spiral stairs known to WHEWELL, *German*

Churches, 8vo., 1842, p. 183. "In the seyde stepul there shall be a vice turning," contract 1435, for college of Fotheringhay. Examples are given:—At Peterhouse, 9 ft. diam., 1438, WILLIS AND CLARE, *Cambridge*, 1886, i, 16. At Arles, the "vis de S. Gilles" in the priory of that name, near the city, with helical vaulting; also at S. Martin, des Barnabites, de S. Roch, at Paris. In church of S. Maclou, at Rouen. An outside cylindrical staircase "from J. Vredeman", is given in LANGLEY, *Masonry*, fol., 1736, pl. 448. The "grant viz" at the château de Gaillon, 1507-9, by P. FAIN. PIGANOL DE LA FORCE, *Descr. de Paris*, 12mo., Paris, 1765, ii, 131, cites a staircase like that at Chambord, but less well made, towards middle of XIV cent. in the church of the old convent of Bernardins at Paris; VERGNAUD-ROMAGNESI, *Archéol. du Loiret, Chambord*, 8vo., Paris, 1832, p. 23; 47. The external circular stairs at Blois is often referred to. VIOLLET-LE-DUC, *Dict. Rais.*, s. v. Escalier, 300. BLONDEL, *Cours*, 8vo., Paris, 1773, iv, 292-4, s. v. Escalier. STERETOMY. 5. 17. 25.

VISARDI (JOHANN ANTON), born 1647; entered the Bavarian service in 1673 on the dismissal on account of incompetency of *baumeister* F. Schinagl; was appointed *hofmaurmeister*, and 1688 *hof architekt*, in which year he went to Landshut to design a monastery for the Jesuits. In 1692 he superseded Lorenz Perti at the Theatin church in Munich under the supervision of the pater Spinelli; the two towers were completed 1696, but the façade, interior decorations, and crypts were delayed. About 1700 he designed the Klosterkirche at Fürstenfeld-Bruck, and thoroughly repaired the monastic buildings. He died 1713. 68.

VISCENTINI (ANTONIO); see VISENTINI (A.).

VISCONTI (LOUIS TULLIUS JOACHIM), born 11 February 1791 at Rome, son of Ennius Quirinus, who 1798 left Italy for France. He became a pupil of C. Percier, and gained prizes in 1814. In 1825 he succeeded Delannoy as architect to the bibliothèque, where 1831, he restored the large room. He designed 1824 the maison and the fontaine du carrefour Gaillon; the house with a terrace at the angle of the rues Neuve Ventadour and S. Augustin; and the decoration of the café Turc. In 1836 he directed the fêtes; 1840-1 designed the works for the reception and the grand carriage (ART JOURNAL, 1841, No. 97, but it was not carried out so richly decorated) of the corpse of Napoleon I; with the tomb in a crypt under the dome of the church of the Invalides, and first opened 14 August 1853, at a cost of about £240,000; ILLUSTRATED LONDON NEWS, 1853, xxiii, 127-30; *The Works of Eminent Masters* (CASSELL), 1854, i, 65-96, gives 40 woodcuts; CHATAUD ET LEJEUNE, *Tombeau de l'emp. Nap. I*, 8vo., 1853; LENOIR, *Tombeau de Nap. I*, 43 pl., 4to., 1855: the ashes of the emperor were transferred to the sarcophagus 2nd April 1861. The tombs of marshal Lauriston, Gouvion Saint-Cyr, Suchet, Soult, and others. The fountains de Molière (MONITEUR DES ARCHITECTS, 4to., v, pl. 49 and xx, pl. 229), 1835 de Louvois (NORMAND, *Paris Moderne*, 1846, ii, pl. 119), d'Antin, rue port Mahon et de la Michodière (NORMAND, ii, pl. 80; and MONITEUR, iv, pl. 44-5); de Fénélon in place S. Sulpice (MONITEUR, xxvii, pl. 319-22); and 1839, the one in rue de Richelieu (GOURLIER, *Choix, etc.*, fol., 1825-50, ii, 259); BUILDER JOURNAL, 1890, lix, 159 and plates. A number of hôtels in the faubourgs S. Germain and S. Honoré, especially that of Pontalba: 1821 maison rue de la Tour des Dames et rue de La Rochefoucault, No. 3 (NORMAND, 1843, i, pl. 53-6); 1825 porte d'entrée de l'hôtel Forbin-Janson, rue de Grenelle S. Germain (NORMAND, ii, pl. 16; and KRAFFT, *Portes Cochères*, fol., Paris, 1838, pl. 59). Maison de mad. Mars in rue de la Tour des Dames (decoration of the billiard-room in THIOLLET ET ROUX, *Modèles de menuiserie*, fol., Paris, 1837, pl. 17). Maison rue de Richelieu (NORMAND, i, pl. 116-8). 1843 the château à Lissy, Seine et Marne (NORMAND, 1849, iii, pl. 65-8). With Barbet de Jouy, a maison aux Champs-Élysées, and another in boulevard du Temple (CALLIAT, *Parallèle des Maisons de Paris*, fol., Paris, 1850-64, i, pl. 81-2 and 62-5). Also, for Napoleon III, the design for the completion of the

Louvre and its union with the palace of the Tuileries, the first stone of which was laid at the end of July 1852 (bird's-eye view in *MONITEUR*, xxi, pl. 242): A. Paccard was then under him; after his death the work was carried on by Lefuel. *Vue perspective de la réunion des palais, etc.*, fol., Paris, 1853. LEFUEL, *Palais du Louvre, etc.*, fol., 1870. BALDUS, *Louvre, etc.*, fol., 300 pl. (1875). He 1831 received the légion d'honneur; was 1845 member of the Académie des beaux-arts; and president of the Société centrale des architectes. He died 27 or 29 December 1853, aged 62, of apoplexy, at Paris, and was buried in Père la Chaise cemetery, where 1859 a monument was raised to his memory. DONALDSON, *Memoir*, in *ROY. INST. OF BRIT. ARCHITECTS*, 1853-54, p. 32; reprinted in *BUILDER Journal*, xii, 26; and *CIVIL ENGINEER, etc., Journal*, xvii, 47. *Fontaines Monumentales construites à Paris, et projetées pour Bordeaux*, fol., Paris, 1860. LANCE, *Dict. Biog.*, 8vo., 1872.

VISENTINI and Viscentini (ANTONIO), also a painter and engraver of Venice. He designed two houses for the English consul Smith, one in Venice, and the other at Mojano sul Terraglio. He published *Urbis Ven. prospectus celeberrimos*, after A. Canal, 38 pl., fol., Ven., 1751; *A New Book of Ornaments* by A. Rosis, fol., 1753; *Virius, etc., of S. Marco at Venice*, 9 pl., fol., n. d.; and *Osservazione sopra gli errori degli Arch.*, contin. al trattato del Galluccini, fol., Venice, 1771. He died 1782 aged 94. James Wyatt studied under him for two years. HUNT, *Architecture Campestre*, 4to., 1827, xiv. SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 471. 5. 26. 30.

VISEU and VIZEU (Lat. Vico Aquario). A town in the province of Beira-alta, near Oporto, in Portugal, situated on a small affluent of the river Dão. It is the see of a bishop, suffragan to Braga. The town was taken 1057 from the Moors for the fifth time. The cathedral dedicated to the Assumption of the Virgin Mary, on a lofty eminence, is a striking building of the Flamboyant period; the stalls have a mixture of renaissance work. Two of the towers are said to be constructed on Roman work. The cloisters are to the south, and a chapter-house above. There are three parochial churches, an old episcopal residence now barracks, the bishop's palace of Fontanello, a seminario with a staircase of peculiar construction, a good and well-arranged hospital, many interesting antiquities, and a good *mata-douro* or slaughter-house. 14. 28. 50. 96.

VISHNU occupies the second place in the Triad of the Hindus and is the personification of the preserving principle. The worship is of very ancient date, and has received considerable changes. A Vishnuité pagoda or choultry *cir.* 1400 at Vellore. HINDOO. 14.

VISIT, or view of inspection. An expert may be appointed in consequence of a difference of opinion, to inspect the works and report thereon to the authorities, on the points submitted to him. He is not necessarily an ARBITRATOR. Many examples occurred in Spanish architecture. 66.

VISMARA (...), with Boni and Castelli about 1635 executed the sculptures of the centre door of the duomo of Milan. 28.

VISORIUM. The audience part of a Roman circus, and of an amphitheatre; the auditorium.

VISUAL ANGLE. See ANGLE OF VISION, or of view.

VIS VIVA. Work, or dynamical effect, supposes a body moved and a resistance overcome.

VITAL (BERTRAND). In 1427 he rebuilt the spire of N. D. des Tables at Avignon (which had been rebuilt 1390 and 1412), it having been struck by lightning. In 1443 he worked on the city walls; demolished the tower behind the cour du Sceau, repaired the breach, and raised a pillar finished by a watch tower like that of the portail de Lates. RENOUVEL ET RICARD, *Maître de pierres de Montpellier*, 4to., Mont., 1844.

VITALIS (TIBERIUS CLAUDIUS). A freedman, whose inscription also records the name of "Eutyhus, architect", who may have designed the large tomb described by DONALDSON, *The Tomb of Vitalis in the Villa Volkonski at Rome*, with plates, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1868-69, p. 223.

ARCH. PUB. SOC.

VITALIS (LUCIUS). An inscription, TI. CLADIVS SCARAPHI L. VITALIS ARCHITECTVS. V. A. XL., etc., is given in MONTFAUCON, *Antiq.*, v, p. 95, tab. 87. 3.

VITAMBEN (PEDRO DE); also P. de Deus Tamben. See DIOS (P. DE).

VITECOQ or VITOCQ (SYMON), a master-workman, who 1527 perhaps succeeded R. de Roux, at the cathedral of Rouen; on 29 June 1529 he was appointed by the canons, maître pour la surintendance des édifices; 1542 he was appointed with J. Delarue to examine Becquet's design for the spire. He made one of the tourelles at the chief entrance, and the galleries round the choir, or clearstory; he was charged with the decoration of the exterior of the Lady chapel as seen from the palace of the archbishop George d'Amboise II. In 1532, associated with Catelin, he completed the jubé of the church of S. Laurent there, which had been commenced 1511 by P. Desvignes. He died before 1548. His son PIERRE, 1576 was maçon tailleur de pierre, and acted as maître de l'œuvre de maçonnerie. DEVILLE, *Revue des Architectes de Rouen*, 8vo., Rouen, 1848, p. 62-4-6; 71-3. LANCE, *Dict. Biog.*

VITELLIANUS. Occurs in an inscription SEX. VEIANVS. SEX. F. QVIR. VITELLIA NVS ARCHITECTVS FECIT SIBI., etc., given in DONI, *Inscr. Antiq.*, 317.

VITELLO (ALESSANDRO), of a good family in Città di Castello, designed the palace in the piazza di Sopra near the church of S. Fortunato, still 1889 occupied by the marchese Bufalini. In 1534 with Pier Francesco of Viterbo and A. Piccone da San Gallo, carried out for pope Clement, the fortezza da Basso or castel di S. Giovanni Battista, near the porta a Prato, at Florence, at that time considered impregnable: under the tower of Toso, various inscriptions and medals were deposited with solemnity and splendour (VASARI, *Lives*, edit. 1851, iv, 13). He died about 1554. PAOLO, his son, in 1540 designed for himself the model palazzo, near the porta S. Egidio. There are three other pal. Vitelli. His son FERRANTE, born about 1536, was a military engineer. MANCINI, *Istruzione, etc., di Castello*, 8vo., Perugia, 1832, ii, 78, 94, 98. 5. 20.

VITERBO (Lat. Vetus urbo. Surrina, not Fanum Volturnie or Voltumna). A city between Rome and Florence, in Central Italy. The walls are flanked by towers of XIII and XIV cents.; it is a well-preserved mediæval city (created 1194); there being also many houses of the Gothic period, as "the palazetto" XII cent. (VERDIER, ii, pl. 213-4); a small house with external staircase (*Illustrations*, pl. 241 or 147); also a small Italian house (LECLÈRE, pl. 113). The principal piazza has arcades around it. There are several fountains, as the fontana grande 1206; in piazza Carlana XIII or XIV cent. (VERDIER); in piazza della Rocca at the porta di Firenze, 1566 attributed to G. Barozzi da Vignola (VERDIER; *ARCHITECT Journal*, 1850, ii, 79; LECLÈRE, pl. 89; *Illustrations*, pl. 143 or 85); that des Gatteschi XIII cent. (VERDIER); one in the Italian style in cloister of Sta. Maria de gradi (LECLÈRE, pl. 10); and a basin supported by figures on rockwork in a lake (SCHEULT, pl. 59). The town is the see of a bishop. The Gothic cathedral, dedicated to S. Lorenzo, is a basilica in form, badly modernised; it has eleven arches on each side with finely carved capitals; a good tessellated pavement; the tomb of pope John XXI, 1276-7 killed by the fall of the roof of a chamber of the episcopal palace; and tombs of three other popes. The detached campanile is a good example of the XIII cent., of white and dark marbles. There are over fifty churches; that of Sta. Rosa has a modern Italian arcade in front of a plain brick façade (LECLÈRE, pl. 24). S. Francesco was originally Gothic, of which period only the transepts remain; the choir is behind the high altar; an octagonal pulpit stands in the piazza at the south corner. S. Michele is "renaissance" in style. S. Angelo in Spata has a Roman sarcophagus. S. Giovanni in Zoccoli, a small Romanesque building. Sta. Maria in Volturna; Sta. Maria della Salute has a good XIII cent. doorway. A small oval (?) church (SCHEULT, pl. 14). The palazzo publico, begun 1264, contains the museum of antiquities, it

has a Roman sarcophagus, and five Etruscan ones in the court, where is also a good fountain. The episcopal palace XIII cent. has a large hall and is greatly dilapidated. The palazzo Farnese is now the foundling hospital. The baths were restored and dwellings added by il Rossellini, *cir.* 1450, which according to BOTTARI were 1739 in decay. The casa del' progetti *cir.* 1750 by P. Posi.

Outside the walls are: the church of Sta. Maria della Verità, *cir.* 1468 with a painted majolica tile pavement. The Dominican monastery and sanctuary of the Madonna della Quercia, said to have been built from the designs of Bramante; it has a good Gothic cloister (LECLÈRE, pl. 45 and 94). The palazzo di S. Martino of the Dora family, has a noble staircase a *cardoni* for carriages to ascend to the upper stories; and the villa Lante at Bagnaia, by G. Barozzi da Vignola (died 1573). On the summit of a mountain four miles distant is a menicatore or Logan stone, 22 ft. long and 9 ft. high. DENNIS, *Etruria*, 8vo., 1883, i, 150. BUSSI, *Istoria della città di V.*, fol., Rome, 1742. CORETINI, *Breve notizia della città di V.*, 4to., Rome, 1774. LECLÈRE, *Recueil d'Arch.*, fol., Paris, 1826, which pl. 34 also gives some buildings near the city. VERDIER AND CATTOIS, *Arch. Civile*, 4to., Paris, 1855-57. SCHEULT, *Recueil*, fol., Paris, 1821. HARE, in *GOOD WORDS Journal*, 1874, p. 83. WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 473. 14. 28. 50. 96.

VITERBO (PIER FRANCESCO DA), a very skilful engineer 1526 was with others employed by pope Clement VII to fortify Parma and Piacenza; also 1533-5 with G. LENO, A. VITELLI, and A. da Sangallo to build the fortezza da Basso or S. Giovanni Battista, at Florence. The duke Francesco Maria of Urbino invited him to fortify Pesaro, but G. Genga intervened.

VITINIUS, is stated to have erected the amphitheatre at Beneventum, in STARKE, *Travels in Europe*, 8vo., p. 343-4; or 1833, 8th edit., p. 401.

VITO (FRANCESCO DE), begun 1325 with Cino di Cenis the certosa di S. Martino, at Naples; but attributed to G. de Sanctis. The church was rebuilt *cir.* 1640 by C. Fansaga.

VITONI (VENTURA ANDREA), born 1479 (?), at Pistoia, was a carpenter, who went to Rome and measured many of the antiquities: and was employed with G. Leno by Bramante Lazzari in the execution of some of his works there, accounting for bad details. About 1508 he returned to Pistoia; and (1494 or) 1509 designed the octagon church of Sta. Maria dell' Umiltà, "in a beautiful and original style, Gothic and renaissance", also attributed to Bramante, and said to have been taken from the sacristy of Santo Spirito, at Florence (VASARI, *Lives*, 8vo., 1851, iii, 86; and *Flor. edit.*, viii, 145). In 1561 Vasari was employed to add the cupola, and he (ii, 442) animadverts on the previous construction. GRANDJEAN ET FAMIN, *Architecture Toscane*, fol., Paris, 1846, pl. 105; and ANDERSON, *Arch. Studies in Italy*, fol., 1888-9. Vitoni is also said to have designed Sta. Maria delle Grazie completed 1535. TOLOMEI, *Guida di Pistoia*, 8vo., Flor., 1821. 12. 28. 68.

VITOZZI (ASCANIO); see VITTOZZI (A.).

VITRARIUS, Vitriarius, and Vitrearius, seems to express both glazier and painter of glass. Seaman (? Simon de Lenn, master glazier, 1349), vitrearius at Ely, was paid a stipend of 52s. a year or 12d. a week and his board. He was also employed at S. Stephen's chapel at Westminster. The glazier 52s., weekly 10d. and 12d. with board, 1357 (?); and vitarius 52s., weekly 2s. and board; BENTHAM, *Ely*, 4to., 1817, Supp., 64-6. TURNER, *Dom. Arch.*, i, 76, notes a *vitrearius*, temp. Henry III, 1216-72. The glazier and his boy were under the sacrist's office at Canterbury; SOMNER, *Hist.*, 4to., 1703, i, 95.

VITRIFICATION. The act of changing into glass. *L'Art de Vitrification*, in *Bib. Scient. Industrielle*. DEVITRIFICATION.

VITRIFIED BRICK. The term given to the material, perhaps first put forward by Elliott of Blisworth, in his patent for the melting or running of clay, sand, limestone, cinders, chalk, earth, and other materials in a state of fusion, into moulds or casts of the shapes of bricks, tiles,

pipes, etc.; CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 231. J. Connop of Hyde Park took out a patent for improvements in melting, moulding, and casting sand, etc.; BUILDER *Journal*, 1850, viii, 550, and ix, 63. The Staffordshire vitrified blue bricks were before 1876; they present close cohesion, a metallic surface, with great durability and adamantine strength. BERARD, *Manufacture by Ignition, of Artificial Blocks for Hydraulic Construction*, in *COMPTES RENDUS*; and in CIVIL ENGINEER, ETC., *Journal*, 1853, xvi, 227. Adamantine or DUTCH CLINKER: BUILDER *Journal*, xvii, 174; BUILDING NEWS *Journal*, 1861; BRITISH ARCHITECT *Journal*, 1890, Nov. 28, p. 416.

VITRIFIED WORK. The name given to a certain rude enclosure whose walls bear traces of having been subjected more or less to the action of fire. It is generally situated on an elevated hill which occupies a strong and easily defended position; it is irregular in form; some walls are 12 ft. high and very broad. John WILLIAMS in 1777 first described these singular ruins and many more have been discovered; Dun Mac Uisneachain is the largest in area, being 750 ft. long by 150 ft. broad. About forty have been found in Scotland; in Londonderry and Cavan; in Upper Lusatia, Bohemia, Silesia, Saxony, and Thuringia; in the neighbourhood of the river Naha, near the Rhine; and a few places in France; not in England or Wales, or in Denmark or Scandinavia. A great antiquity has been assigned to these structures but without sufficient proof; they were perhaps in use as late as the early centuries of our era. s. Laing, *Prehistoric Remains of Caithness*, 8vo., Hertford, 1866, goes to show that they were places in which human sacrifices were made. DUN, CHALMERS, *Caledonia*, London, 1807-24, i, 471. ARCHÆOLOGIA, v, 255; vi, 88; and x, 147. CORDINER, *Antiq.*, etc., of the North of Scotland, 4to., London, 1780. PENNANT, *Tour in Scotland*, 4to., London, 1790, 5th edit., ii, 165. WILLIAMS, *Remarkable Ancient Ruins*, 8vo., Edinb., 1777. KING, *Munimenta Antiqua*, fol., 1799-1805, i, 27. ENCYCLOPEDIA BRITANNICA, 9th edit., 1888, also gives a list of books on the subject. PRYER, at British Archaeological Association, *On Forts*, and particularly that upon Craig Phadrig, near Inverness, about 100 ft. by 250 ft.; BUILDER *Journal*, 1846, iv, 370. HIBBERT, in 1831. ATHENÆUM *Journal*, 1854, p. 467. BRITISH ASSOCIATION, *Congress* at Aberdeen, 1859. BUILDER *Journal*, 1868, xxvi, 157. 14.

VITRIOL. A name formerly and still given to sulphuric acid, and to certain sulphates. Oil of vitriol is concentrated sulphuric acid; CIVIL ENGINEER, ETC., *Journal*, 1844, vii, 87. BLUE VITRIOL IS SULPHATE OF COPPER. Green vitriol is sulphate of iron (COPPERAS, ferrous sulphate). White vitriol is sulphate of zinc. 14.

VITRUVIAN SCROLL (*It. poste*; *Fr. postes*; *Ger. wellenformige verzierung*). A peculiar pattern of scroll-work, consisting of convolved undulations, used in classic architecture, and why it has obtained the term "Vitruvian" attached to it is unknown. MAEANDER. The cornice of the Choraic monument of Lysicrates, which is otherwise very simple, is crowned with a sort of Vitruvian scroll, instead of a cyma. No other cornice of an ancient building existing, and decorated in this manner, has hitherto been published; yet temples crowned with this ornament, are frequently represented on medals. There is an example in the paintings in a MS. of Virgil in the Vatican library. The upper ornament (*Fr. postes*) is rarely found, as here introduced, in Greek edifices, but an approximation to the form among fragments found in the so-called Treasury of Atreus; it is frequent on fictile vases, and is supposed to typify the successive waves of the sea. The uniform vertical ornament at the edge of the cymatium of the corona, called usually the honeysuckle ornament (*Fr. fleuron* and *palmette*), perhaps originated from an imitation of the antefixe terminating the *horæ* or joint tiles. Among the ruins of Epidaurus is a very ancient and elegant pedimental fragment thus terminated; DODWELL, *Tour in Greece*, 4to., 1819. VULLIAMY, *Ornamental Sculpture*, fol., 1825. KINNARD, in STUART, *Athens*, 2nd edit., fol., 1825,

i, 55. ROSENDAHL UND ASMUS, *Hilfsbuch beim Zeichnen Archit.*, etc., fol., Berlin (1834-42), give many variations of this ornament.

VITRUVIUS CERDO (LUCIUS). A freedman of Lucius, about A.D. 265. The inscription L. VITRUVIVS L. L. CERDO ARCHITECTVS, is recorded in GRUTER, *Inscr.*, 186, from the arco de' Gavii, at Verona, of the Corinthian order; it was destroyed 1805 by the French. SERLIO, *Architettura*, fol., Ven., 1633, p. 203. This arch was followed by F. Aligeri in his design for the tomb to his brothers in the church of S. Fermo, at Verona.

VITRUVIUS POLLIO (MARCUS), is now presumed to have been born at Formiæ in Campania (the present Mola di Gaeta), from the number of inscriptions relating to the Gens Vitruvia found there, and not at Fondi, Verona, or Placentia, as has been asserted. He lived in the time of the emperor Augustus (B.C. 30-14 A.D.; between the death of Julius Cæsar 45 and battle of Actium 31;) with whose father and sister he was acquainted, and who gave him a pension for life; and to whom Vitruvius, after 25 B.C., dedicated his work *De re Edificatoriâ*, written when he was well advanced in life. It is the earliest work on the subject which has been preserved. He mentions, v, 1, that he designed the basilica and adjacent ædes Augusti at Fanum and describes it restored by VIOLET-LE-DUC, *Entretiens*, 8vo., Paris, 1863, i, 148-59, pl. 8-9; that he had the care of the various engines of war, together with M. Aurelius, P. Numidius, and Cn. Cornelius; and mentions the theatre of Pompey. The temple of Jupiter Anxur at Terracina of the Romans, erected for the consul Posthumus, has been attributed to him. In the British Museum is a fragment of a small sepulchral tablet, which is supposed to refer to this writer. It belonged to the "Temple collection" and was obtained from Baïæ in Campania; the in-

scription is given in REALE ACCADEMIA ERO-

COLONIA DI ARCHEOLOGIA, *Memorie*, 4to., Naples, 1852, iv, pt. 2, p. 225. BAYLE, *Diet.*,

Art. Naples (Alfonse, roi de), quotes from A. PANORMITA, *De dictis et factis Alphonsi*, lib. 1, num. 47, that Alfonso (1442-58) hearing that at Formium (Formianum) was the tomb of Cicero, found that of a Vitruvius instead. The question of his period is exhaustively considered in MAURAS, *L'Arch. de Vitruve*, 8vo., Paris, 1847, i. 1. 3. 5. 14. 25. 95.

In book 3 he gives the canon of the proportion of the human frame, handed down from the Greeks; a drawing by Leonardo da Vinci with a translation of this part of Vitruvius into Italian, is so clear that it is considered he must have had access to a more perfect MS. than at present exists; BONOMI, *Proportions of the Human Figure*, 8vo., 1855. He names (i, 1, and viii, 3) the writings now lost, of Greek architects to whom he was indebted for information, namely Agatharcus, Democritus, Anaxagoras, Silenus, Theodosius, Ctesiphon, Metagenes, Phileos, Ictinus, Carpin, Theodorus Proceus, Hermogenes, Philo, Argeus, Satyrus, and Phyteus; as well as others who wrote upon subjects more or less bearing upon the art. PLINY in *N. H.*, and FRONTIUS, *De Aquæd.*, are the only ancient authors who quote this work, the former without acknowledgment. At the Institute of British Architects, April 17, 1837, was read part of the correspondence between Schütz and Goethe, on the authenticity of the work attributed to Vitruvius; the opinion of the writer being that it was a compilation about 970-998 by or under the auspices of pope Sylvester II; (GENTLEMAN'S MAGAZINE, 1837, vii, p. 522). LEAKE, *Peloponnesiaca*, 8vo., 1846, p. 128-9, after referring to the inclination of columns, entasis, and enlargement of angular columns, writes, "Other examples occur in the work of Vitruvius, which prove that in some instances he had accurately derived his information from the great Greek authorities whose names he has preserved. The examples, however, are not less numerous of his disagreement with the extant monuments of Greek architecture; a circumstance which, combined with the style of some parts of his work more resembling the Latin of the age of Diocletian than of Augustus, leads strongly to the suspicion that we possess no more than parts of the original work of Vitruvius, blended with productions of a later age."

HIRT, *Sur le Pantheon*, in WOLF AND BUTTMAN, *Museum der Alterthum's Wissenschaft*, 8vo., Berlin, 1807, places the work between the years 738 and 741, by internal testimony.

"His industry has been said to have produced a set of formulæ or receipts after which temples and other buildings were to be erected; the conventionality he advocated, to an imaginative Greek the enslaving of art, was readily accepted by the practical Roman, who, with no time for invention, preferred erecting his temples according to a fixed law, to trusting to that innate sense of art which has no law, and of which he possessed only a very moderate share;" PARKER, *Hist. Constr. of Walls of Rome*, 8vo., Oxford, 1874, chap. 3, p. 69. During the mediæval period, it is recorded that the celebrated Eginhard (768-840), *Epis.*, xxx, apud Duchesne, p. 701, studied the work (RAMÉE, *Histoire de l'Arch.*, 8vo., Paris, 1843, ii, 125). The MS. of 1316 in S. John's college, Oxford, belonged to S. Augustine's abbey, Canterbury (ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 4to., 1836, p. 120). "Cesare Cesariano, 1521—reveals the estimation in which Vitruvius was held during the middle ages, and the interpretations of his rules entertained and attempted by artists of that period; which deserves a special investigation, as explaining a vast number of formulæ not to be otherwise accounted for." COCKERELL, *William of Wykeham*, in Brit. Arch. Association, 1840, p. 33. The MS. was "first found" by Poggio, a Florentine (or BRACCIOLINI) in the monastery of S. Gall, as stated in his "*Epistolæ*, p. 346", noted p. ix of the *Intro.* to ALDRICH, *Elements of Civil Architect.*, 8vo., Oxford, 1789, but it is taken from FABRICIUS, *Bib. Latina*, 8vo., Lips., 1773, i, cap. xvii, p. 480-99, and is not found in Poggio. Q. DE QUINCY, in *Biog. Univ.* (Michaud), 8vo., Paris, xliii, states that the first MS. was found in the library of the Benedictine abbey of Monte Cassino, near Naples, and that the best one is in the library of Franeker. SELVATICO, *Venezia*, 8vo., Ven., 1847, seems to consider that the ten books were not known until 1452.

In the British Museum are seven MS. codices; the Harleian 2767 of IX cent., considered by DONALDSON as the purest, having no omissions; the others of before XII cent., and of XIV and XV cents. These are described by DONALDSON, *Ancient Doorways*, 4to., 1833. The chap. 2, book 1, of the first-named codex was collated with the others for the preface to POCOCK, *The Elements of Design*, printed in the *Detached Essays* 1848-49. Another codex of XV cent. in the museum is from the Arundel collection of the Royal Society, which was known to EVELYN (*Diary*, Aug. 29, 1678). Other MSS. in public libraries are mentioned by GWILT in his translation into English of *Vitruvius*, 8vo., London, 1826; and by DONALDSON, in ROY. INST. OF BRITISH ARCHITECTS, *Transactions*, 4to., 1835-6, i. The "editio princeps" of Sulpitius is believed to have been published at Rome, 1486, by G. Herolt, without title-page and few cuts. The translation into Italian by CESARIANO, fol., Como, 1521, amongst other cuts gives Milan cathedral, explaining how this Gothic building was erected according to the rules, as then understood, of Vitruvius; the columns are placed inside the building. The chief editions are Philander 1552; Galiani 1758; Schneider 1808; Poleni 1825; and Marini 1836-7. The several printed editions are noted in POLENI, *Excerpt. Vitruv.*, 4to., Padua, 1739; while the *Catalogue* of the INSTITUTE shows that only a few editions are required to form a complete collection. The English translations comprise MOXON, *The Theory and Practice of Architecture; or Vitruvius Abri'd*, transl. from PERRAULT, 8vo., London, 1692, and later editions. By NEWTON of the whole work, fol., 1771-91; while that of WILKINS, 1812, only gives Books 3-6 incomplete: these were followed by GWILT 1826 as above stated. Other English translations (not printed) are recorded to have been made by "Mr. Christopher Wase" (HARRIS, *Lectures Tech.*, 1710); and by J. L. Bond, architect, died 1837, who left a manuscript the work of some twenty years. *Illustrated Editions*, in BUILDING NEWS *Journal*, 1871, xxi, 421; and VITRUVIUS, by ATCHISON, in ROY. INST. OF BRIT. ARCHITECTS, *Journal*, 1890, p. 411.

VITRUVIUS or architect of the Hindoo. The term *silpi* or

stapati: see VICASWARMA. *The Hindu Vitruvius*, by SIMPSON, in ROY. INST. OF BRIT. ARCHITECTS, *Journal*, 1887-8, p. 36.

VITRY (URBAIN), was appointed architect to the city of Toulouse, where 1827 he designed the bronze colonne monumentale to general Dupuy with its fountain; and 1844 the observatory. He published *Le Propriétaire architecte*, 2 vols., 4to., Paris, 1827; and by MANDAR, 1838 and 1842. *Dict. complet d'Arch. Civile*, 12mo., Paris, combined with *Le Vignole de poche*, 12mo., 2nd edit., 1827; 1840; 5th edit., 1843. GOURLIER and others, *Choix d'édifices*, fol., Paris, 1837-44, ii, pl. 351-2, and pl. 356. He was member of the société des beaux-arts.

VITTONÉ (BERNARDO), designed several churches at Turin between 1750-70; of which that 1751 of Sta. Maria di Piazza is one. In 1767 Blancus engraved a "vue d'une de quatre angles de la maison des juifs". STEFANO, *Torino*, 8vo., Turin, 1852.

VITTORIA (ALESSANDRO), also called A. Victorias, best known as a sculptor, born in 1525 at Trento, was sent by his father Vigilio to Venice while young, to study drawing under J. (Tatti) Sansovino; where 1553 he completed his master's church and high altar of S. Giuliano; and designed the church (or only façade) of S. Zaccaria (attributed to A. di Marco, in the *Handbook*), the statue 1595 of the saint over the entrance is by him. In 1571 he designed the chapel and altar of the Rosaria in the church of SS. Giovanni e Paolo with sculpture and stucco work; the scuola, or oratorio, di S. Girolamo in S. Fantino (now the *ateneo veneto*) with bronze and marble statues; the principal part of the façade of the scuola del Corpus Domini; 1538-56-77 in the doge's palace, the statues and stucco work to the scala d'oro with Franco; the ceiling in the sala del quattro porte of Palladio's design; and that of the squittinio; and the *pozzi* in the cortile. Various works in the churches of S. Rocco, S. Sebastiano, S. Francesco della Vigna, the tombs of Priuli in S. Salvatore, and various bronze candelabri in S. Stefano. Also 1582-90 the fine but incorrect palazzo Balbi near the canal grande. His works are to be seen at Padua, Treviso, Brescia, Verona, and Trau. Many sculptures at Venice are named in SELVATICO, *Venezia*, 8vo., Ven., 1847, p. 384-95, and 507. He died March 27, 1603, aged 83, while living in a boat when erecting the palazzo Balbi, and was buried in the church of S. Zaccaria, where his tomb, designed and partly executed by himself, is on the right of the door leading into the sanctuary, inscribed "A. V. qui vivens vivos duxit E marmore vultus". TEMANZA, *Vite*, 4to., Rome, 1778, p. 475-98.

VITTOZZI and VITTOZZI (ASCANIO), of Orvieto, practised at Turin, where 1582-1607 he designed the church of SS. Trinità; its dome and decorations were done later, and in 1830 the façade was restored: the Capuchin church near the tempio della gran Madre di Dio: 1607 the chiesa del Corpus Domini (the interior embellishments 1753 by conte B. Alfieri); and the sanctuary of the Madonna di Vico, near Mondovì, after S. Peter's at Rome, which was only furnished by 1877, it belongs to the House of Savoy. He was architect to Carlo Emanuele I. He died 1615, and was buried in the church of SS. Trinità. STEFANI, *Torino*, 8vo., Turin, 1852. *Théâtre des États du Duc de Savoie*, fol., La Haye, 1700, from the Latin of BLAU 1682 by BERNARD.

VIVARIUM. The place attached to an amphitheatre to keep the creatures to be exhibited in the arena; also for fattening animals. The term BESTIARIUM is now used by many Italian antiquaries for this place.

VIVARY. Another term for a STEW for keeping or breeding fish.

VIVIANUS; of IX and X cent., erected the church of S. Salvador at Valdedios in Asturias; and S. Pedro de Montes, in diocese of Astorga, in Spain, where he is recorded in an inscription, given in MILIZIA; and in LLAGUNO.

VIVIERS (Anc. Alba Augusta; Albia Helviorum). The ancient capital of Vivarais. A town in the department of Ardèche, in Languedoc; and situated on the river Rhône. The

old walls still remain; and the town, the see of a bishop, has a labyrinth of narrow streets partly crossed by arches; the hôtel d'Albert de Noe in the chief place, is good Renaissance work. A small cathedral, dedicated to S. Vincenzo, has a choir of XIV cent., the nave is modern: the octagon tower is Romanesque. There are six churches. A handsome bishop's palace; and a house of the chevaliers, with Renaissance details, are given in TAYLOR AND NODIER, *Voyages Pitt.* (Languedoc), fol., Paris, 1833-42, ii, pt. 2: the last is given in LA BORDE, *Mons. de la France*, fol., Paris, 1836, ii, pl. 229.

VIVO. A term used in early translations of Italian works, for the shaft, or fust, of a column. Also in a more particular sense for the naked, or plane, of a column, or other part; BUILDER'S *Magazine*, 4to., 1774, and *Dictionary*, 8vo., 1734.

VIVROUX (JACQUES), born between 1760 and 1770 at Liège, practised at Verviers. He designed the agrandissement of the château de Jusleville at Spa; the château des Mazures, its bridge entrance, near Verviers (pl. 43-4); and a house in the rue des Récollets (pl. 99); in CASTERMANS, *Parallèle des Maisons de Bruxelles*, fol., Paris, 1854. GOETGHEBEUR, *Choix des Monuments des Pays Bas*, fol., Ghent, 1827, p. 59.

VIZEU. See VISEU, in Portugal.

VIZIAPUR, corrupted from Vijayapura. See BEEJAPORE, in Hindostan.

VLADIMIR or Wladimir. The capital of the government of the same name. From 1157 to 1328 it was the residence of the grand dukes, and the capital of Great Russia before Moscow. It is situated on the rivers Klyasma and the small Lybed. There are six gates in the walls. The houses are chiefly of stone. It is the see of an archbishop. The kremlin on a hill contains two cathedrals, that of the Uspenski (Assumption of the Virgin Mary) 1154-60, rebuilt after 1238, thoroughly restored 1774, and again 1834, is exaggerated in descriptions; it contains the tombs of the princes of Vladimir; and the other to Dmitrievski (S. Demetrius of Solun), 1194, restored in 1834, it is a good specimen of the Russo-Byzantine style. There are twenty-five churches, several of which date from XII cent.; some are handsome edifices. The monastery of S. Alexis is used as the archbishop's palace; and another as large barracks. The assembly house of the nobility with a fine hall, and a gymnasium with a good library, are modern. No vestiges remain of the palace of the princes; and the so-called "Golden Gate" is so only in name, a triumphal gate 1158 surmounted by a church, destroyed 1238, and rebuilt much later. COCHRANE, *Russia*, 8vo., 1824, i, 91. BRENNER, *Russia*, 8vo., 1839, ii, 195. DEMIDOFF, *Excursion Pitt.*, etc., in *Russie*, fol., Paris, 1840-7, 100 pl. SCHNITZLER, *La Russie Ancienne et Moderne*, 8vo., Paris, 1855. *ENCYCLOPÆDIA BRITANNICA*, 9th edition, 4to., 1888. MASKELL, *Russian Arts*, 8vo., London, 1884.

VLADIMIRA, Wladimira or Uladimira. A city near Lublin, in Volinia or Vollynia, in European Russia; situated on the river Louia, an affluent of the Bog. It is the see of a bishop.

VOCABULARY OF TERMS in Architecture. See TERMS.

VOGHERA (LUIGI), born 25 May 1788 at Cremona, studied under F. Rodi. He went to Milan and 1814-17 made many "designs" for structures at the academy of fine arts. At Cremona, he designed two *pergami* for the cathedral; the casino Zaccaria for a café; restored the gates of the city, and designed those of S. Luca, Po, and 1826 Margherita (built 1685 by B. Orsi). He also designed the *macello pubblico*; proposed a façade to the imperio doganale; designed the façade to the church of S. Agata; restored the façade, etc., of palazzo Treccchi for the *municipale* and picture gallery; Gothic façade to the casa di ragione; façade to the palazzo vascovile; a silk factory or warehouse; casino for the Zaccaria family; restored the interior of the church of S. Agostino, with a new altar; façade of the casa Pallavicino ex Zaccaria; façade of the house of the engineer in capo della Provincia: façade of another casa; tower to casa del E. Bertarelli; the *cimitero pubblico*; 1838 the

triumphal archway for the entry of Ferdinand I: besides the façade of the church of S. Ilario; the façade to the palazzo di Soresina Vidoni; with eight *projets* for palaces and churches.

Outside the city, he designed the façade to and restoration of the church of S. Bernardo; the casa comunale di Casalbuttano; tower of parish church of Soresina, and its cemetery; tower of parish church of Castelleone, with arch, and casa comunale; the parish churches of Casteldidone, and of Gron-tardo; tower of that of Piadena; picture gallery in the garden Picenardi-Sommi in S. Lorenzo; casa Favagrossa in Casal Maggiore; the restoration of castello Manfredi in Cicognolo; the tomb of G. di Soresina Vidoni in S. Gio. in croce; and near Mantua, the parish churches of Riva and Cicognara, and the auitaneo Virgiliano (ascribed to G. Cantone of Forlì) in the city; also the villa Vidoni in the duchy of Parma. All the above are taken from the list of plates to *Raccolta dei Disegni dell' architetto L. V., compilata dai figli Achille ed Oreste, pubblicata dall' ingegnere P. Gallotti*, fol., Milan, 1842, 120 plates. The date of his death is not found recorded.

VOGHERA (GIOVANNI) called Giuseppe in NAGLER, a younger brother, engraved plates for a *Storia i monumenti di quell' antica ed illustre città di Pavia*; or *Antichità Pavese*, fol., Pavia, 1825-8, fasc. 1-16; and published *Illust. dell' arco del Pace in Milano*, fol., Milan, 1838, 28 sheets. GRASSELLI, *Abecedario-Cremonesi*, 12mo., Milan, 1827. 68.

VOID (Fr. *vide*, mod. *vide*). A certain space left by the designer in the apparently solid portions of a building as much for lightness as for artistic or economic reasons. For example, the mass of building as the attic of a triumphal arch, or a colossal gateway ought to present a grand superficies of building on the outside. Not only is there no object, in view of the stability of the edifice, that this mass of work should be solid, but there is a desire that the weight on the arches and piers should be lightened. Cavities or voids or rooms are therefore made in this attic, thus economising both labour and material. In the masonry of some great buildings another method has been employed by using earthenware pots in the walling, as in the circus of Caracalla. By this means the weight of the solid masonry is considerably lightened without diminishing its superficial area. FOR CONSTRUCTION. The term is also given to an opening through a wall, as for a door or window. 1. 25.

VOIDE PLACE, "with storehouses, tracteries, for framing, longing unto the said office (of works) within our palice of Westminster, Towre of London," etc.; 4 Edward IV, 1464; *ROLIS OF PARLIAMENT*, v. 530a. 1 *Kings*, c. 22, v. 10; and 2 *Chronicles*, c. 18, v. 9: *in a void place*, or "floor", as in the margin. The Eastern threshing-floor was a level smooth area, inclosed by mud-brick walls, having a proper opening for entrance, and on one side of it the barn or garner. A place of this description was very proper for such an attendance as is noticed in the text; and very convenient, not merely to accommodate the two kings and their courtiers, but also to separate them from the populace, the mass of the army, etc.; Calmet, in D'Oyly and Mant's *Bible*.

VOIDS AND SOLIDS (Fr. *vides et pleins*). The proper proportion of one to the other is the essence of good architecture. This important subject is treated in its several phases in most works on design and construction. Q. DE QUINCY, *Diet. d' Arch.*, s. v. *Vuides et Pleins*. "The ratio of solids in vertical sections of Gothic buildings," is treated in GWILT, *Encyc. of Arch.*, edition 1888. 25.

VOIT (JOHANN MICHAEL), born 13 December 1771 at Anspach.

VOIT (RICHARD JACOB AUGUST), born 1801; studied at Munich in 1822 under J. A. Gaertner, whom as *oberbaurath* he succeeded in 1847. He travelled to Italy and France, and on his return 1823-4 he designed the cemetery church of the protestants at Augsburg, and various churches, as at Homburg, Lingenfeld, Waldsee, Berghausen, etc.; the *rathhaus* at Landau and at Anweiler; the corn market at Kaiserslautern; the synagogue at Speyer, and another; a prison; and the breeding stables at

Zweibrücken, etc. At Munich he designed 1846-October 26, 1853, the new pinakotheca, *BUILDER Journal*, 1853, xi, 513, 678; and 1863, xxi, 697; *CIVIL ENGINEER, ETC., Journal*, 1847, x, 345; with additions in 1855, xviii, 112; and made the drawings for the first volume 1845, continued by Guhl and Caspar, of KUGLER, *Kunstgeschichte*, 8vo., 1842-48. In 1841 he was appointed professor of architecture in the academy at Munich on the resignation of his master. 68.

VOLACINUS. Occurs in an inscription VA. SELENE VOLACINO MAR CON QUO V LX AN XL SINE VLLA DISCORDIA ARCHITECTO ET VOL. HIL. LAB. B. M. P. FABRETTI, *Inscr.*, p. 176, No. 353. MURATORI, *Novum Thes.*, ii, 976.

VOLAND or Vollant (S...), practised at Lille, where he designed 1682 the porte de Paris; 1701 the pont neuf; the salle des concerts; the hôpital général for 1,600 persons, founded 1739; the palais de justice; and the palais des archives. GUILBERT, *Histoire des villes de France*, 6 vols., 8vo., Paris, 1844-48.

VOLARY (Lat. *aviarium*; It. *uccellaja*; Sp. *volera*; Fr. *volière*). A place exposed to the air and enclosed with trellis-work for keeping and breeding birds. The Romans directed great attention to aviaries; VARRO, *De Re Rustica*, lib. 3, deals with them at considerable length.

9 April 1684. To Wm. Chiffinch to be by him paid to John Fitch for building a little house in St. James's park for the dog-keeper and a kennel for the dogs and a new ducquoy in the park £162 10s.

10 January 1687-8. To Wm. Storey keeper of the Volary in St. James's park in part of his bill of £184 13s. for several provisions—for the fowle birds and beasts under his care from 1 Apr. 1685 to 1 Oct. last £140 6s. 6d.

CAMDEN SOCIETY, *Secret Services*, 1678-88, 4to., 1851, p. 82, 178. CUNNINGHAM, *Handbook to London*, 8vo., 1891, s. v. Storey's Gate.

VOLATERRE, Velathri, now VOLTERRA. One of the most ancient cities of Etruria, situated on the river Era. The walls extended four or five miles in circuit; in them is the *porta all' arco*, having three heads projecting from the voussours, it is 21 ft. high, 13 ft. 2 ins. wide, and 30 ft. deep; the much later channel for a portcullis is still visible in it. Near the church of Sta. Chiara are some of the finest portions of the walls, of horizontal courses—they are seen here in detached fragments—the sixth fragment is 15 ft. thick, 40 ft. high, and about 140 ft. long, with two mouths of old sewers in it; some of the stones are 8 ft. or 10 ft. long by 2 ft. to 3 ft. in height. The *porta di Diana* is a double gate similar to the previous one. Walls also are seen at Le Balze di S. Giusto; and near the seminario. The remains of an *amphitheatre*, perhaps only made to see the game of *pallone* still played there. The *piscina* or reservoir, called *il castello*, discovered 1739, being three parallel vaults supported by six piers, 71 Engl. ft. long, 48 ft. wide, and nearly 31 ft. high, and now considered Roman work (REPETTI, *Diz. Geog. della Toscana*, 8vo., Fir., 1833-46 v. 816: RONDELET, *L'Art de Bâir*, fol., Paris, 1812, pl. xii). The two *terme* or baths are also Roman. The *neropolis*, of which only three sepulchres remain, those opened having been filled with earth; the grotta de' Marmini, the tomb of the Cecine, discovered 1739, another 1785, and a third 1810. In 1831 two tumular or domed sepulchres were found. At the villa Inghirami to the east of the town, are two fine tombs, one found in 1861, in the form of a Latin cross; also the tortuous passages called *Duche de Saracini*. Volterra like Chiusi has been the great depository of cinerary urns, ranged round the interior of the *ippogei* or vaults, cut out of the solid rock; forty to fifty were found in one cave. The modern town is situated within the old walls, and has walls of its own. The citadel dates from 1343, and is of the time of the Florentines who built the circular tower, *il mastio*, with its dungeons. The "neat" and small cathedral, dedicated to the Assumption of the Virgin Mary, dating from 1120 is said to have been enlarged 1252-4, or interior and façade, by N. Pisano; in 1574 it was restored by L. Ricciarelli who added the capitals of the Corinthian order, with the armorial bearings in the side aisles. The altar was by G.

Vasari. The octagonal baptistery of S. Giovanni 1252 is supposed to be on the site of a temple of the Sun; its font 1502 by A. da Sansovino; the ciborio 1471 by Mino da Fiesole. Among the churches is that of S. Lino, founded 1480 and finished 1517, cost 80,000 scudi. S. Francesco, rebuilt 1623 is much altered; a door leads into the chapel of the confraternità della Croce di Giorno, 1315 built by Mone Todirigi. S. Michele 1285 with a Lombard façade, was restored 1828. S. Agostino, xvi cent. was restored 1728. A small chapel near the gate of Florence is attributed to B. Peruzzi who also painted the interior of it. The *palazzo pubblico*, de' priori, the podestà, the former capitano di giustizia, a gloomy palazzo of 1208-57, is covered with coats of arms; its tower with four columns on the top similar to the tower of the traitors at Florence was 1472 the scene of an insurrection; it has been rebuilt since it was shattered by the earthquake of 1826. The houses are very ancient, often having modern towers; the three-towered casa Guarnacci has an inscription over the door of the first tower stating it was built early in xiii cent. by its architect Girolamo da Lugano. The torre degli Auguri 1299 by the hospitalers of S. Giacomo in Altopascio. The casa Ducci. Casa Ricciarelli, the residence of the painter D. da Volterra (1509, died 1566 at Paris). The casa Masselli. The *museo nazionale* is of high interest; it was newly housed and arranged in 1877 by A. Cinci. The public library contains 13,200 volumes, and some ivory sculptures. The fountain of S. Felice has two pointed arches like those at Siena. Volterra supplies the gypsum or alabaster, used for ornamental work and sculpture in Italy; the brown coloured is *bardiglio di Volterra*. GORI, *Museum Etruscum*, fol., Flor., 1737-43, iii, 63. HOARE, *Classical Tour through Italy*, 8vo., 1819. TORRINI, *Guida per la città di Vol.*, 1832. DENNIS, *Etruria*, 8vo., 1878, and 1883, ii, 136-94. 14. 25. 28. 50. 96.

Near the city is the convent of S. Girolamo; the tombs near the villa Inghirami, as above mentioned; the church of S. Giusto, xvi cent.; and the monastery or Badia di S. Salvatore, xi cent., of Camaldolese monks, of a basilican form with apse, but is dismantled; its Doric cloister is good.

VOLCANIC MOSAIC. Tufo encrusted in the surfaces of stone or marble of a lighter or warmer colour. The duomo at Monreale with its great cloister; the cathedral and the tower of the church of La Martorana at Palermo; the churches at Amalfi and Ravello; the church of S. Paul d'Issoire in France; all of xi and xii cents., exhibit best specimens of this work, so well adapted for external decoration; WYATT, *Mosaics*, fol., London, 1848, p. 17.

VOLCANIC STONE. See LAPIS GABINUS; LAVA; PEPERINO and piperno; PUMICE; TUFA; TUPO.

VOLCI. See VULCI.

VOLE. "To the plummer for mending the vole in the fellows' garden," 1625-6, at Queen's college, Cambridge. WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., Camb., 1886, iii, 623. It is the trap for catching the animals generally called water-rat, red field-mouse, and short-tailed field-mouse, or properly the water, bank, and field voles.

VOLKHNER (OCTAVIAN) of Cracow, employed at Wien; see FALKENER (O.).

VOLKOF and Volkhov. A native of S. Petersburg; and a pupil of C. de Wailly at Paris, where he is said to have been employed on the erection of a theatre, perhaps under his master. In 1762-96 he designed the little Hermitage palace, ascribed 1765 by Lamotte (or Vallin de la Mothe) for empress Catherine; 1796-1801 added to the Taurida palace by Starov; and before 1816 the two warehouses for wine and salt, all at S. Petersburg. *Annals of Academy of Fine Arts*, p. 37. SVININ, *Descr. de S. Peters.*, 4to., S. Pet., 1816-28, i, 87.

VOLLANT (S.). See VOLAND (S.).

VOLOGDA or Vologda. The capital of the government of the same name in the eastern portion of European Russia, and situated on the river Vologda. It was a colony of Novgorod, and after many battles with it, was 1447 annexed to, Moscow;

it declined after the foundation of S. Petersburg. The town, which is chiefly timber-built, and open, has eight quarters, and is the see of a bishop. The cathedral was founded 1565; there are about fifty churches, six being of stone, one dating from xii cent., and a seminary for 600 sons of priests. 14. 28. 50.

VOLSINII of the Romans; see BOLSENA, in Italy.

VOLSURA. See VOUSURE.

VOLTERRA. The modern name of the Etruscan VOLATERRA. VOLTERRA (DANIELLO DA). See RICCIARELLI (D.).

VOLTERRA (FRANCESCO DA), also Volaterano da Vollterra, F. Volaterano, F. Franco Volaterano, perhaps of the Ricciarelli family, was brought up to inlaying work in woods and ivory, which he left for architecture. He practised at Rome, where 1581 he restored the church of S. Tommaso in Parione (LET., 339; and TIRO, p. 108); designed about 1580 the interior of Sta. Maria in Aquiro; the fountain of Monte Citorio (PALDA, *Romanorum Fontinali*, fol., Nur., 1685, pt. 1, pl. 18); completed the nave of the chiesa degli Orfanelli: 1586 the palazzo Lancellotti, via de' Coronari, for pope Sixtus V (1585-90), completed by (all by, in FERRERIO, pl. 91) C. Maderno (LET., 707, pl. 346); and the fourth chapel for the Lancellotti family in the basilican church of S. Giovanni in Laterano (LET., 485); and the façade (TIRO, 91) to the church of Sta. Maria Virgini di Monserrato, of which only the first order is executed (RUBEIS, pl. 68). In 1592 he "built" the church (designed 1592 by M. da Castello) or nave only of Sta. Maria della Scala (ROSSI, *I mon. più inter. di Roma*, fol., Rome (1818), pl. 37; TIRO, 33) up to the cornice; façade (RUBEIS, pl. 69) by O. Mascherino. Designed the church of S. Giacomo degl' Innocenti; the chapel of the cardinal A. M. Salviati in the church of S. Gregorio on monte Celio, completed by C. Maderno (TIRO, 61); church and monastery, or only façade (TIRO, 129) to Sta. Chiara, but design attributed to C. Maderno, or only the altar by him (PASCOLI): 1600 the elliptic church of S. Giacomo degl' Incurabili, the choir, high altar, and façade by C. Maderno (RUBEIS, pl. 58-60; M. G. ROSSI, *Nuove Splendore*, fol., Rome, 1686, pl. 7); and the chapel and altar of casa Gaetana in the church of Sta. Pudenziana (ROSSI, *Altari*, fol., Rome, n. d., pl. 36-7). F. Breccioli was a pupil. He died in 1588. RUBEIS or ROSSI, *Insignium Romanæ Templorum*, fol., Rome, 1684. LETAROUILLY, *Œuvre Moderne*, 4to. and fol., Paris, 1840. TIRO, *Ammaestramento di Roma*, 12mo., Rome, 1686. 3. 25. 31. 38. 63.

VOLTERRA MARBLE. An alabaster, transparent, of a milk-white colour, very soft as it may be scratched by the nail, it does not effervesce with nitric acid. It weighs 154 lbs. to the foot cube. CLARAC, *Musée du Louvre*, 8vo., Paris, 1841.

VOLTRI MARBLE. A modern green marble, like the Egyptian green; but it shells off in the open air. CLARAC, *Musée du Louvre*, 8vo., Paris, 1841.

VOLTUMNÆ FANUM; now supposed to have been the site of the modern Surrina; near VITERBO.

VOLUNTEER DRILL SHED; or exercise house. RIDING-HOUSE.

... Darmstadt; RONDELET, *L'Art de bâtir*, 1832, pl. 112. 1861 At South Kensington, 90 ft. x 40 ft., cost £250. *BUILDING NEWS Journal*, vii, 48.

1861 Bradford, 97 x 60, iron roof. *BUILDER Journal*, xix, 867; and B. N. J., vii, 71.

1862 Birkenhead, 200 x 52 x 28.6. B. J., xx, 49.

1862 Newcastle, 200 x 100. B. J., xx, 176.

1862 Bristol, 145 x 94. B. J., xx, 265.

1865 Camberwell by J. T. Lepard, £4,700.

1865 Cardiff, 148 x 66; a gun shed 95 x 38; parade ground, dwellings, etc.; by A. Roos for marquis of Bute; three companies at a time can drill in it.

... Norwich, 144 x 62.

1867 Great Yarmouth, 114 x 60 x 30 high, J. T. Bottle, £1,300. B. N. J., 502. B. J., 843.

1867 Hecknondyke, Yorkshire, I. L. N., 22 June. B. J., xxvii, 952; xxviii, 44.

1870 Newcastle-on-Tyne and Gymnasium, by T. Oliver. B. N. J., xviii, 18. 1860 New York; New state arsenal, 7th Avenue, West 35th street.

In a roof, 190 x 82. B. J., xviii, 60.

1883 Bloomsbury, 70 x 50. On site 60 x 150. B. J., xlv, 740.

1886 Wolverhampton, about 140 × 70, and head-quarters; by T. Arkell of Birmingham.

1886 London Scottish. B. J., i, 879; and li, 119.

1889 London, Artists' Corps, 52 × 100. B. J., lvii, 442.

1890 London, S. George's Rifles, by C. H. Shoppee. B. N. J., lix, 750.

Volunteer Review Grounds. B. J., 1864, xxii, 263.

Rifle Butts. B. J., 1860, xviii, 158, 176, 192; 600; and B. N. J., 1860, vi, 702, at Leicester.

VOLUTE (Lat. and It. *voluta*; SERLIO, *Architettura*, fol., Ven., 1633, p. 293-5, calls it *carlozzo*, but *viticcio* in Tuscany: Sp. *concha*; Fr. *volute*; Ger. *schnecke*). A spiral scroll on each face of the capital of the IONIC ORDER of columns. VITRUVIUS, 3 and 4. The volutes were supposed to represent the hair of a female head, this order being emblematical of feminine delicacy; also to have been derived from the horns of goats and rams. ANTHEMION. HOGG, *On the Origin of the Floral Ornaments, the Ionic Volute, and the Wave Line of the Ancient Greeks*, in ROY. SOCIETY OF LITERATURE, *Trans.*, 2nd series, ii, 1847, p. 179-93. In the Greek style the volutes, or the circumvolutions of the spiral, present a flat face on the two opposite sides of the capital, the flanks (BALUSTER, BALTEUS, CUSHION, PILLOW, PULVINATION) being generally formed like two cones united in the centre by an ornamented band or fillet. The volute of the order of Erechtheus and of Minerva Polias has a double line (HEM, RIND or bark). In Roman examples, several show the volutes curved forward so as to allow of the four faces of the capital being alike: the column at the angle often showing only three faces and a baluster. The *calche* or EYE OF THE IONIC VOLUTE on the coffin found in the tomb of Bliznitsa, in the Bosphorus, 1864, "was inlaid with glass as was the case also in the architecture of the Erechtheion at Athens"; NEWTON, *Essays*, 8vo., 1880, p. 383. In the ANGULAR COLUMN, the volutes are contrived to present the same face in flank as in front, and the returns occur on two sides. In the *musée* at Brescia is a capital with angular volutes. 1. 2. 5. 14. 25.

The following works give details of various examples of volutes. STUART, *Antiq. of Athens*, fol., 1794-1816, ii, cap. 2, pl. xii; iii, c. 8, the colonnade near the lantern of Demosthenes, pl. xxxix, 2nd edition. INWOOD, *Erechtheion*, fol., London, 1827, pl. 20-5, p. 127, 135. TEXIER, *Asie Mineure*, fol., Paris, 1839-49. HIRT, *Baukunst der Alten*, 4to., Berlin, 1809, pl. xi; 1821-7. PRANESI, *Della Magnif. di Romani*, fol., Rome, 1761, xvii. MAUCH, *Darstellung*, 4to., Potsdam, 1875, 7th edit. SOCIETY OF DILETTANTI, *Antiquities of Ionia*, fol., 1769, 1797, 1840, 1881, and *Unedited Antiquities of Attica*, fol., 1817; 1833. NICHOLSON, *Principles of Architecture*, 8vo., 1795-8, iii, pl. 84, 88.

The writer in the PENNY CYCLOPEDIA, 1843, s. v. *Volute*, states he "examined a cast made at Athens by professor T. L. Donaldson, and found that each spiral (s. v. *Column*, p. 336) as far as c, or thereabouts, was remarkably true to the logarithmic spiral; but that from c the law of the curve changed, and the acute angle made by the tangent with the radius vector began to increase until it became a right angle at a." NICHOLSON, *Architectural Dictionary*, 4to., 1819-35, 1852-4; and 1857-62, describes how to draw the logarithmic spiral, following the volutes of the temples of Erechtheus and Minerva Polias: also of the Ionic temple at Athens, the temple of Bacchus at Teos, and that of Minerva Polias, at Priene. The method of describing the volutes of the temple of Diana at Ephesus is distinctly shown in one of the examples at the British Museum; the eye has not been cut out and the compass points remain: the radius diminishing as the eye is reached; WOOD, 1883-84, p. 169.

P. de l'Orme went to Rome, *cir.* 1530 where he erected scaffolding, and preceded Palladio (1570) in the discovery and publication (*Architettura*, 1567, fol., 162 verso) of the ancient process of drawing the volute of the capital preserved in the church of Sta. Maria di Trastevere; BERTY, *Les Grands Architectes*, 8vo., Paris, 1860, p. 42. Miglioranza found in 1855 at Vicenza, a capital of the Roman period showing the lines for its formation, which show that Palladio had explained the method. MARCOLINI published the rules by G. Porta detto Salviati, *Regola di par perfettamente la voluta et del capitullo Ionico et d'ogn' altra*

soste, fol., Ven., 1552; in Latin by POLENI, in *Esercitazione Vitruviana*, 4to., Utini, 1825-30. GOLDMANN, *De Quinque Ordinibus Architecturae*, fol., Lug. Bat., 1622, and in *Vitruvius*, fol., Amst., 1649; followed in sir W. CHAMBERS, *Decorative part of Civil Architecture*, fol., 1759. SELVA, *Delle differenti Maniere di Discrivere la Voluta Ionica*, 4to., Padua, 1814. MARINI, *Vitruvius*, fol., Rome, 1836-7, iv, pl. 33-4.

LANGLEY, *Ancient Masonry*, fol., 1736, gives on pl. 105-6, 116, 127, 133, 164-5, various methods invented by architects. LANGLEY, *Builders' Complete Assistant*, 4to., 1738, 3rd edit., pl. xii. GEO. MADDOX, explained in CIVIL ENGINEER, *ETC.*, *Journal*, 1844, vii, 6. Jos. Gwilt, in *BUILDER Journal*, 1860, xviii, 364; and also in his *Encycl. of Architecture*, edit. 1888, § 1925b; § 2576. A system is given by J. Robinson for the capitals of the north portico of the Erechtheum and the Propylea, in PENNETHORNE, *Geometry and Optics of Ancient Architecture*, fol., 1877, p. 132-148, The Ionic Capital.

Instruments.—The *Multimeter*, by John W. HANCE. JOPLING, *The Elliptograph*, in BRADLEY, *Practical Geometry*, 8vo., 1834, and SOCIETY OF ARTS, *Transactions*, 49. PENROSE and Bennett, *The Helicograph*, described in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 10 March 1851. JOPLING, *Impulse to Art*, 8vo., 1849, describes a method of drawing a volute by a particular and simple arrangement "of two cranks and a link, or a link and two strings"; by which Mr. Penrose arrived at so near an approximation "to the volute of the Ionic column of the Propylea", of which he and Mr. T. J. Willson obtained exact measurements at Athens, that he can "hardly resist the conclusion that Mr. Jopling has discovered the method used by the Greeks in drawing their volutes"; PENROSE, at ROY. INST. OF BRIT. ARCHITECTS, 18 March 1850. One was described by H. Johnstone, at BRITISH ASSOCIATION at Cambridge 1862.

VOMITORIUM. The Roman name for the door to the avenue or staircase by which people entered to and retired from the *Visorium* of a circus or amphitheatre, to gain their seats. There were many of them in each edifice. 25.

VORHERR (JOHANN MICHAEL CHRISTIAN GUSTAV), born in 1778; studied architecture at the academies of Berlin and Paris, and with a pension from the king of Prussia travelled in Germany, Switzerland, France, Netherlands, and England. He was from 1801 to 1803 at Schlitz, where he built the new schloss Halleberg, several bridges, etc. He was afterwards imperial *baumeister* at Fulda, where he conducted the building of the new Wilhelm-strasse, a new church, schools, and a hochstrasse, besides many other works, devoting himself to promoting the amelioration of the dwellings of the poorer classes; and 1806-9 was employed in France in the department of public buildings. In 1809 he received an appointment at Munich, and continued to rise in the service. Introducing beauty into landscape he published *Der Monatsblatt für Bauwesen und Landes verschönerung*, 4to., Munich, 1815, one of his many works on this subject. 1823 founded a school for artisans at Munich for instruction in winter; where during his twenty-four years of superintendence he had 2,000 pupils. Of other publications by him was one for the use of this school in 2 vols., 32 pl., 1825. He received the Greek order of the Saviour, and died in 1847. His best designs and works were published in fol., 1849. 68.

VORONEJ, Voronetz, and Woronesk. The capital of the government of the same name in south Russia, situated on a very steep rock on the river Voronej near its confluence with the river Don. The name occurs as early as 1177; this town was founded 1586 against the Tatars. A new fortress of oak was formed 1672. Peter I, 1694 built fortified docks and a palace, now nearly obliterated. The old buildings of the town were burnt 1773. There are at least eighteen stone churches; the cathedral is dedicated to . . . ; two monasteries, that of Metrophanes founded 1836 contains four churches, in the chief of which, rebuilt of stone in 1735 are the relics of that bishop and saint in a silver shrine. There is an archbishop's palace and the governor's residence. A monument to Peter I was raised in 1860, and another to Koltsof. HASSEL, *Das Russische Reich*

in *Europa*, 1821. SCHNITZLER, *La Russie*, etc., 1835. Edward Daniel CLARKE, *Travels in Russia*, 4to., 1810-23 and 1827-34, speaks of great improvements. 14. 28. 50.

VORONICHIN (ANDREI NIKOPHOROVITCH), Varonikin, Veronikhin, Voronikin, Voronikhin, Waronchin, Woronikin, born 1760, a native of Russia, a serf of count Alex. Stroganov who 1777 sent him to Moscow to study under Bazhenov and Kazakov, then travelled with the son of his patron to Europe, returning 1790 to S. Petersburg, where he became professor of architecture. He was selected by emperor Paul I, 1800-11 to design the cathedral of the Mother of God of Kazan, at S. Petersburg, a poor imitation of S. Peter's at Rome with the colonnade in front; it was restored 1830; SVININ, *Descr. de S. Pet.*, 4to., S. Pet., 1816-28, i, 45; ii, 89. CIVIL ENGINEER, ETC., *Journal*, 1844, vii, 44. In 1802 he was ordered to reconstruct the grand terrace at the Strelna palace; the colonnade in the gardens at Peterhof; to design several villas at Gatchina and Pavlovski; and many country-houses for count Stroganov. He died Feb. 21 (March 5) 1814 rather suddenly. GRANVILLE, *St. Petersburg*, 8vo., 1837, ii, 480, describes the Kazan church. Cameron is recorded to have competed for this church; hence Bazhenov (died 1799) may also have made a design for it as asserted; BROWN, *Sacred Architecture*, 4to., 1844, p. 50. N. Kukulnik, in ENTZIKLOP LERIKON. *Annals of the academy of fine arts*, p. 38. 14. 68.

VORST (S... VON), master-mason of Louvain, who 1419 began to rebuild the church of S. Sulpice at Diest, where he was succeeded by his pupil de Layens who completed it 1456, the tower was finished about 1490. From 1 March 1439-42 August he designed and built the addition to the old hôtel de ville at Lovain, of the present council-chamber, reception-room, and secretary's offices, since completely modernised. He died September 19, 1439, and was succeeded by J. Keldermans. (LOVEN.)

VOSGES GRANITE. See GRANITE (p. 78).

VOSTALIS (GIOVANNI BATTISTA), of Sala, in Italy, was in the service of emperor Rudolph II (1576-1612), for whom he designed the schloss and church at Podiebrad, wherein he is buried. He died there in 1575. The epitaph describes him as "S. C. M. supremus architector adificiorum". His son (?) Udalrich was ennobled in 1581. FIORILLO, *Geschichte der Malerei*, 8vo., Goett., 1798-1820. 26. 68.

VOSURA and VOUSURA. See VOUSURE.

VOTIVE COLUMN. There is one in Chartres Cathedral; the chief one is at Zaragoza, of which a description appeared in the *Tablet* newspaper of about 15th Oct. 1890. NORTHOTE, *Celebrated Sanctuaries of the Madonna*, 8vo., London, 1868. TRINITY COLUMN. A "votive altar" in S. Stephen's church at Vienna, is given in *Allgemeine Bauzeitung*, 1855, pl. 717.

VOUCER. See VOUSOIR.

VOUSOIR (Fr. *claveau*). Each of the wedge-shaped stones by which an arch is formed. As a mediæval word it only occurs in the Ely rolls, as 33 (1359-60) and 42 (1368-9) Edward III, vousoir, vovsure, vauing; and vawcer, voucer, vovser, wawcer; in WILLIS AND CLARK, *Cambridge*, 4to., 1886, iii, Glossary. GIMAL, occurs in LEONI, *Palladio*, 1742, ii, 46. *Ounci* or pennants of the arch, in EVELYN, *Account of Architects*, fol., 1706, p. 27. For vaultings of large span RONDELET, *L'Art de Bâtir*, thinks wrought stone preferable to brick or rubble, being liable to less settlement and stands more independent of any cementitious medium employed. This does not connect wrought stone so powerfully as it does rubble; but in the former cramps and dowels can be employed at the joints, which are useful in doubtful cases to prevent derangement of the parts. In many ruins of the Roman period, the surfaces of the vousoirs were embossed and hollowed at the joints (JOGGLING), for the purpose of preventing their sliding upon each other; and expedients of the same nature are frequently found in Gothic ruins; GWILT, *Encyclopadia*, § 1499. CAIN, *Voussoir Arches applied to Stone Bridges, Tunnels, Dowels, and Groined Arches*, 1879, New York. *Restoring the defective arch stones of*

Blackfriars Bridge, INST. OF CIVIL ENGINEERS, *Proceedings*, i, 131; and PENNY CYCLOPEDIA, s. v. *Arch stones of New London Bridge*, *idem*, iii, 109. *On the construction of arches with hollow cast-iron vousoirs*, CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 201. 1. 5. 16. 17. 25.

VOUSURE, vesura, veusure, vousura. A vault, or vaulting in general. "To make a certain privy chamber—in the fashion of a turret with a double vaulting (*duplici vousura*) and a chimney in the same"; *Liberate Roll*, 1238-9, 53 Henry III. "Upper *vousura* of the chapel of S. Stephen", 1330-31, 4th Edward III. *Fousura*, 1346-7, 20th Edward III. "Timber of the *vousura* of the upper chapel" and carpenters working "upon the *vousura* of the chapel", 1347, 21st Edward III; (BRAYLEY AND BRITTON, *Palace of Westminster*, 8vo., 1836, p. 164). "Pecit dealbare volsures in retrochoir," SWAPHAM, *Peterborough Chronicle*. 1. 5. 25.

VOUSURA and VOWSER. See VOUSURE.

VOYER. A term used in France, *i.e.*, inspector of roads; as "voyer de la ville", in DESJARDINS, *Hôtel de ville de Lyon*, fol., 1867, p. 8. Louis le Vau, who died 14 Feby. 1661, was "voyer et maistre des œuvres des bastiments du roy" at Fontainebleau. This was a clearly defined office and universal in France.

VOYER (ROBERT LE), *Kriegsbaumeister* in XVII cent. in the service of the emperors of Germany. 68.

VREDEMAN (JAN); see VRIES (J. V. DE).

VRIEND (CORNELIS DE), Vriendt, Vrint, usually called Cornelis Floris, also a sculptor, born in 1518 at Antwerp, son of Cornelis, a stonemason (died 1538), and brother of Frans (Floris) de Vriend, the renowned painter. He studied at Rome and was the first to introduce the *grotesques* into the Pays-Bas. He designed the hôtel de ville at Antwerp, 27 Feb. 1560-1 and completed 1565 at a cost of 400,000 florins; it was partly burnt 4th Nov. 1576 and was restored 1581-5 by P. Luydick. From May 5, 1564-8 he designed the house of the Oosterlings (maison des villes Ansiatiques) for the Hanseatic league, 240 ft. long by 213 ft. deep, surmounted by a lofty tower; it now serves as the residence of the consul of the free towns, and as warehouses. Also the house of his brother Frans, decorated outside with painting and sculpture. 1566 he carved the bas-reliefs, etc., of the jubé and altar of S. Andrew in Tournai cathedral. H. Cock published some designs by him. He died 20 February or October 1572, (1575 NAGLER), at Antwerp, aged 54, and was buried in the cemetery of the Récollets. *Guide to Antwerp*, 12mo., Bruges, 1885. COMMISSION ROY. D' HIST. DE BRUXELLES, *Bulletins*, 8vo., Brux., 1837, p. 10; 1848, xiv, 49, 543; 1849, xv, 208. 68. 101.

VRIES (ADRIAAN DE), decorated the Wallenstein, Waldstein, or Friedland, palace at Prag, designed 1629-32 by G. B. Marini of Milan. 101.

VRIES (PAUL DE) or Vredeman, published *Plusieurs menuiseries comme Portaulx, Garderobbes, Buffets, Chalcets, Tables, Arches, Selles, Bancs, Escabelles, Rouleaux à pendre touailles; Cassettes à verres, et beaucoup d'autres ouvrages*, 23 pl., 1630; republished 40 pl., fol., Bruxelles, 1869. *Recueil de Cartouches*, rep. 24 pl., 4to., Brux., 1870; ADAMS, *Décor. Int. et Meubles des époques de Louis XIII et XIV*, fol., Paris, 1861-64.

VRIES (JAN VREDEMAN DE), called Fredeman, Frisius, Frysius, and Phrys, born 1527 at Leeuwarden in Friesland; studied glass-painting and perspective under R. Gerritsz of Amsterdam; went to Mechlin and then settled for a time in Antwerp, where 1549 he was employed with others to paint the arches erected for the entry of Charles V and his son Philip. He had two sons, Paulus (1554-98) and Salomon (1556-1604), both artists. A portrait is given in VAN MANDER, *Leven der Schilders*, 8vo., Amst., 1764. The following are among the twenty-six books of prints by and after him engraved by H. Cock and H. Hondius: *Arx perspectiva*, 4to., 1559; 1568; 1577, 1581, 1604, 1620; enlarged by MAROLOIS, 1628, 1633, 1644, 1662. *Scenographia*, 1560. *Caryatides*, 1563. *Pictores, Statuarii, Architecti, Latomi*, 1563. *Architectura* with the orders, 43 pl., 1563; or *Architectura*, ou

bastiment prins de Vitruve et des anciens escrivains, 19 pl. (and other titles), 1565, 1577, 1581; 23 pl. 1598; also 1628, 1632, 1651 by Hondius. *Boeck opde Colommen*, 1565; or *Les cinq rangs de l'arch.*, 1617 by Hondius. *Compartimenta*, 1566. *Fontes et putei*, 1568, 1574. *Form und weis zu bauen*, 1573. *Panoplia*, 18 pl., 1577; 1585. *Hortorum, Viriarum, formae elegantes*, 1583; 1615. Some of these plates have been reproduced at Bruxelles; as *Cartouches*, 1870; *Arabesques*, 1870; *Caryatides*, 1870; *Variae Architecturae formae*, 1877. He died after 1604, not 1588, as stated in PILKINGTON, *Dict.*, 1829. 101.

VUGH. The term used in mining for a cavity.

VUIET (GERARD), maitre masson et architecte des bastiments du roy, pris au gros pavillon des Tuileries. He died 27 May 1658, and was buried in S. Germain l'Auxerrois. HERLISSON, *Actes d'état*, 8vo., Orleans, 1873, p. 457.

VULCAN CEMENT; or Sachs' patent (1882) metallic vulcan cement, made of slate refuse.

VULCANIZATION. See CAOUTCHOUC. J. L. Hancock's patent vulcanized indiarubber, described by BROCKEDON, at the ROYAL INSTITUTION, 1847; CIVIL ENGINEER, ETC., *Journal*, x, 186; *BUILDER Journal*, 1857, xv, 145; which 1860, xviii, 520, records the death of C. Goodyear, the inventor of the manufacture in 1839. "Vulcanised fibre", a substitute for leather, rubber, gutta-percha, as packing for taps, valves, washers, etc. Vulcanized indiarubber seems to absorb heat in contraction and give it out on distension, this produced an effect called *eremacausis*, which eventually causes its disintegration.

VULCANUS; TEMPLE TO. Of the Romans; the Hephaestus of the Greeks; Sethlans of the Etruscans, where he was one of the twelve great national gods; was worshipped at Perugia (DENNIS, *Etruria*, 8vo., 1883, ii, 435, and in Egypt, as at Memphis, under the figure of a monkey. The god of fire. He was the patron of all artists working in iron or metal; but according to Virgil and others, he does not produce his wonderful works of art alone, but is assisted by the Cyclopes, his workshop being in some volcanic island; the favourite island was Lemnos, where he was lamed in one foot by his fall from Olympus when hunted by his mother Juno. VITRUVIUS, 2 vii, states that the temple of Vulcan should be away from the city which would consequently be freed from the danger of fire. Worshipped in Samothrace; at Agrigentum (of the Doric order); at Rome, from the earliest time, where a temple was built close by the Comitium; from the stories and rites it may be inferred that this temple was viewed in a similar light to that of Vesta, as a place of union or the central point of the state: the round church of S. Teodoro in the Velabrum was probably built on the ruins of a temple called by some to Vesta, and by others to Vulcan and of the Penates; BURN, *Rome and the Campagna*, 4to., Cambridge, 1871-6, p. 278, 316. 6. 7. 59.

VULCI or Volci of Etruria, now represented by Musignano, about 18 miles north-west of Corneto, in central Italy. A city whose name since 1828 is so well known for the enormous treasures of antiquity it has yielded. It lies near the ponte della Badia, probably partly of Etruscan and Roman workmanship, 10 ft. wide, about 243 Fr. ft. long, with high parapets, an arch 62 Fr. ft. span and 96 high above the stream; another arch, 15 ft. span, merely lightens the length of walling; *Annales Inst.*, 1832, p. 261; and *Mon. Ined. Inst.*, i, pl. 41. Of the town there is little Etruscan work remaining; it is about two miles in circuit. It stood at least as late as the fourth century after Christ—one of the wealthiest and most luxurious cities of ancient Italy—the chosen residence of the princes of Etruria. The necropolis of sunk tombs embraced both banks of the river Fiora. The painted tomb discovered 1833 was destroyed and is now only seen in the British Museum; another tomb was found in 1857. By 1856 some 15,000 tombs had been found, of which about 6,000 had been opened 1825-29; in the ceiling of one is a FAN-PATTERN noticed s. v. "La Curcumeila" is a mound about 200 ft. diam. and 40-50 ft. high encircled by a wall of masonry, similar to that of Alyattes at Sardis; near it is

a similar mound "La Cucumelletta"; and a third "La Rotonda" about 30 ft. diam., walled with travertine blocks. A warrior was found in a fourth. The small aqueduct in *Canina, Archit. Ant. Romana*, fol., Rome, 1834, pl. 104-6; CRESY, *Encycl. of Engineering*. GERHARD, *Rapporto intorno i vasi Volcenti*, in *ANNALES* of the Inst. di Corr. Archeologico di Roma, 1831. (*BUILDER Journal*, 1860, xviii, 493.) CAMPANARI, *Descr. of the painted Greek Vases lately found at Vulci*; and *Sep. of Etruria*, 8vo., 1832. DENNIS, *Etruria*, 8vo., 1878, 2nd edit., i, 436-66. *BUILDER Journal*, 1862, xx, 449, tomb.

VULGAR. The term applied to shams in architecture. An elevation of a building overdone with incongruous ornament, such as attaching compo with wire to an iron girder and lining it to appear like the joints of an arch; the Gothic work of Batty Langley; artificial ruins; brickwork of loud ill-assorted colours in stripes, etc. PUGIN, *Contrasts*, 4to., 1836. R. R. R.

VULGRIN, born at Vendôme, a monk of the abbey of Marmoutiers under abbot Albert, who for his merits in architecture appointed him prior. Geoffry Martel, comte d'Anjou, learning his talents called him to Angers and appointed him abbot of S. Serge in that city, where 1036-56 he repaired that monastery, as recorded in an inscription—"incepta monasterii (S. Serge) aedificia absolvit, basilicam elegantiam structuram construxit," and is considered to have built the choir of the abbey church. He became bishop of Mans 1055-6, when he commenced to rebuild the cathedral of that city on a vast scale, and died 1064 before its completion; BODIN, *Recherches sur l'Anjou*, attributes to Vulgrin the church of All Saints, at Angers. COMITÉ HISTORIQUE DES ARTS, 8vo., Paris, 1842-3, ii, 58-9. GODARD FAULTRIER, *Chroniques d'Anjou*, 8vo., 1840; *L'Anjou et ses environs*, 2 vols., 8vo., Angers, 1839-40.

VULLIAMY (LEWIS), born 1790, became an articulated pupil of sir Robert Smirke, R.A. In 1813 he obtained the gold medal, and 1818 the travelling studentship, of the royal academy of arts in London. He made the drawings for *Plans, etc., of the Castle at Newcastle-on-Tyne*, fol., 1817, v, pl. 10-8, for the SOCIETY OF ANTIQUARIES. Returning in 1821 he published *The Bridge of Sta. Trinità at Florence*, fol., London, 1822; and *Examples of Ornamental Sculpture in Architecture, from Greece, Asia Minor, and Italy*, fol., London, 1823. A list of his designs compiled by himself is given in the *BUILDER Journal* 1871, xxix, 142, of which the following comprise the chief edifices in London:—1829 S. Barnabas church, Addison road south. 1830-31 S. John's church, Richmond, cost £7,000. 1830-2 the Law Institution, Chancery lane, and 1836 other works. 1831 Christ church, Woburn square. 1831-33 Highgate New church, on the site 1694 of Ashurst house, the iron gates on brick piers with eagles remain; *MIRROR Journal*, 8vo., 1833, xxi, 305). 1835 S. James's church, Clapham common, £6,500, for 1,250. Christ church, Rotherhithe. 1838-9 church of S. James, Curtain road, Shoreditch. 1838 Royal Institution, façade, Albemarle street. 1840-1 Lock Hospital, 1845-7 the chapel, 1846-7 the asylum wing, Westbourne green, Harrow road. S. Matthew's church, and 1842 S. James's church, Bethnal green. 1846-9 All Saints' church, Eanismore gardens, Knightsbridge, and some works at Rochester cathedral. 1848-1857 Dorchester house, Park lane, for R. S. Holford, esq.; and Westonbirt house, Tetbury, Gloucestershire (*MAGAZINE OF ART*, 4to., 1883, p. 397). 1849 All Saints' church, Bethnal green. 1851-2 S. Margaret's, Isleworth, for earl Kilmorey; S. Bartholomew district church, Sydenham. 1852 house and offices, Sherfold park, Tunbridge Wells, for hon. Percy Ashburnham, £6,240. Among his pupils were J. Williams, W. Wright, Owen Jones, F. W. Porter (1837), W. Bryson, ... Crossley, ... Young, and ... Stokes. John Johnson, Talbot Bury, and E. Walters were assistants. He died 4th January 1871, aged 80, at Clapham common. In 1814 J. D. Patison was preparing *Illustrations of London*, 3 vols., 8vo., aided by Porden and Vulliamy (printed?).

VULLIAMY (GEORGE JOHN), born 19 May 1817 in Pall Mall, second son of B. L. Vulliamy, watchmaker, who 1791-4

sank the first artesian well in England, still in Norland square. George was placed with J. Bramah and son, engineers, and then July 1836 with sir C. Barry for five years, for whom he acted as clerk of the works at the Reform club, and Highclere castle. During 1841-3 he travelled in Greece, Asia Minor, and Egypt, and made some drawings for GALLY KNIGHT, *Eccles. Arch. of Italy*. He 1838 designed a Gothic villa for the coast of the Baltic, for a Russian nobleman; 1853 Swiss protestant church, Endell street, S. Giles-in-the-Fields; 1857 church and schools at Greenhithe, Kent (with John Johnson), for rev. Fuller Russell; memorial tower to earl of Ellesmere; mansion at Dyffryn, Merionethshire, for H. P. Powell, M.P., cost £70,000; with additions, etc., to houses at Dinder, Somersetshire. Lastly, alterations with portico to London and Westminster bank, S. James's square. On March 15, 1861, he was elected superintending

architect to the metropolitan board of works, and designed for them large additions to the offices in Spring gardens, the group of buildings on the south side of Queen Victoria street, between Bucklersbury and Sise lane, a block of stabling in Hamilton place; several stations for the fire brigade, lamp standards on the Victoria embankment, and the large ones to Northumberland avenue at Charing cross, the pedestal and sphinxes to the obelisk on the embankment, and resigned 10 May 1886 on account of ill-health. In 1838 he was elected an associate of the roy. inst. of British architects, 1856 fellow, and 1877-83 was a member of council. He died November 12, 1886, aged 69, and was buried at Stone, near Dartford, Kent. BUILDER *Journal*, 1886, I, 760; and II, 724, 753.

VULNE WINDOW. See LOW SIDE WINDOW.

VYCE and Vys. Winding stairs; see Vis.

VENTILATION.

VENTILATION, as applied to buildings, may be defined to be a means for the supply of fresh air, and the withdrawing foul air.

The importance of ventilation has long been recognized; the ancients fully appreciated its value. The Romans, in their architectural arrangements, invariably kept it in view; Varro, Hippocrates, and Galen, knew its importance; the two former succeeded in curing epidemic diseases by making simple openings in the walls of sick chambers; and the latter gave it as his opinion that as a remedial measure in cases of disease it was of great value. Nevertheless the nations of modern times have very much neglected the subject; and it has only been within a very recent period that its paramount necessity has been fully recognized.

To be convinced of the importance of ventilation with reference to the maintenance of sound bodily health, we have only to consider the extreme delicacy, and beauty, of the organs of respiration placed within the human body, by which the inhalation of pure, and the exhalation of impure, air is involuntarily kept in action. While contemplating the complication and extent of the provisions that have been made for this purpose, it is impossible to avoid contrasting them with the comparative indifference that is in general entertained by man himself as to the proper exercise of the functions of respiration.

As being foreign to the practical nature of the following remarks, it is not intended to notice the evidence which has been collected, having reference to the effects of impure air, on the bodily and mental constitutions of parties submitted to its influence. Much has been already written and said on the subject; and the reader, careful of such matters, may derive much useful information from the works mentioned at the close of this article.

The practice of ventilation will herein be treated under three divisions; which may be considered as an elucidation of the plans generally adopted. These may be briefly stated as:

1. Fire draught; and Currents of heated air, *i.e.*, Artificial Currents; 2. Machinery; 3. Natural Currents.

The theory requires only a simple statement. Atmospheric air is composed of nitrogen and oxygen, in the proportion of one part of the latter to four of the former. By the peculiar action of the organs of respiration, the air is drawn into the lungs, there imparting the oxygen or life-supporting principle to the blood; and receiving in its turn the carbonic acid and other impurities. Changed in its composition from a healthy to an unhealthy nature, by the act of expiration it is forcibly discharged from the lungs. This poisonous gas, thus obtained, it is the duty of efficient ventilation to remove from within the zone or range of respiration. In buildings, in addition to this source, the air is vitiated by the products of combustion from candles, gas, and other like causes.

If the reader will turn to the definition at the commencement of this article, he will perceive that two points are there specifically mentioned:—now it must be conceived that it is entirely owing to a misapprehension or ignorance of the real nature of ventilation as there stated, that so many attempts have proved decided failures. Parties who have attempted ventilation by making provisions only for the egress of foul, or for the admission of fresh, air, have wondered why success has not attended their efforts; the reason simply being, that they had omitted the very essence of ventilation as indicated in that definition.

The important desiderata then, are, apertures for the *ingress* of pure, and for the *egress* of foul, air; without provision for both no satisfaction will be obtained. Egress apertures alone, will be totally inefficient in removing foul air from the interior of any apartment, for air cannot by any possibility be removed, unless there is a corresponding admission of purer and denser air to supply its place, in other words, to supplant it and push it out. Dr. REID (p. 81, *Illustrations of Ventilation*, 8vo. Lond. 1844) thus clearly and forcibly puts the case. "A moment's reflection will satisfy the mere student as to the truth of the position, that, unless a new portion of air be admitted into any apartment, the portion which is already there will not be expelled. It is necessarily impossible to have ventilation without a movement of air. An ingress and egress might certainly, under peculiar circumstances, be effected alternately by one and the same aperture, and satisfy all the essential wants of nature, as in the case of ordinary respiration, where the mouth and nostrils serve as a passage for air both in inspiration and respiration; but, unless its action were sustained by a mechanism as powerful in proportion to the movement of the air required, and as regular and effective in its operation, it would be vain to expect that it would meet the demands of ordinary ventilation."

In these short remarks, then, it seems to appear, that to ensure the full effect of ventilating arrangements, it is absolutely necessary to have egress and ingress apertures acting in concert; not having one to the exclusion of the other; these being inseparably associated with, and dependent on each other. And at this stage, the question, naturally arising, where is the best place to make the apertures for the egress of the foul air? at the highest or lowest part of an apartment? receives for answer that the highest is preferred without hesitation; and this decision is not given in ignorance that it will incur the opposition of parties who hold the following and reverse opinion: "Air when expelled from the lungs, being composed chiefly of carbonic acid gas, the specific gravity of which is more than one-half heavier than common air, must necessarily have a descending movement and fall towards the ground—consequently it is easiest to withdraw it from the lowest part." But in answer to this, the evidence of every day experience shows, that air in that condition not only does not fall, but on the contrary has an upward tendency, and that moreover one of considerable force.

To prove this truth, it is only necessary to observe, that when we breathe in the open air, in a calm frosty day, we see the vapour, or in other words, the partly condensed breath, fly upwards; if blown forcibly downwards, even then it will be seen to move upwards, as soon as it is relieved from the controlling power; besides, at the floor of a crowded apartment, the air is comparatively pure; near the ceiling it cannot be breathed with impunity; the reverse ought to be the case, were the principle, above noticed, correct. The odour of scented condiments is felt sooner above the head of the party partaking of them, than below the zone of respiration, because the air containing the perfume, being heated, ascends. "The ascending movement is also the natural system—were vitiated air to descend, in a very short time the surface of many districts would become so largely contaminated with it, that disease and death would speedily ensue on every side."

It is to a certain extent true that carbonic acid gas, when highly concentrated, does occupy the lower portion of our atmosphere; witness the Grotta del Cane, old wells, excavations, brewers' vats, etc., etc., but yet it is equally true that when mixed with a considerable proportion of air, or as emitted from the lungs, it invariably moves upwards. If this were not the case, carbonic acid gas would never be found in the upper portions of inhabited apartments; it is there, however, where it is to be found in largest quantities. Again, carbonic acid gas has been found at the tops of the highest mountains.

It is not, however, enough to state that the carbonic acid evolved during respiration does not separate from the gases with which it is mingled; the expired air as a whole, in consequence of its temperature and the moisture associated with it, is specifically lighter under ordinary circumstances than the surrounding atmosphere, being composed of carbonic acid gas, azote, and moisture or steam, each being specifically warmer, bulk for bulk, and weight for weight, than atmospheric air: and, therefore, for a variable period after it is discharged from the lungs, even supposing the carbonic acid not to diffuse itself further in the atmosphere, the vitiated air remains above. If then, the vitiated air be removed by an overhead opening, it will be carried away with the least chance of contaminating the remaining atmosphere. The most rational mode of procedure, therefore, will be to adopt plans in unison with, and dependent upon, the laws of nature; moreover, in accordance with that arrangement which almost universal experience dictates: this has been dwelt upon, as it is important to lay the bearings of the case fully before the reader.

VENTILATION BY MEANS OF FIRE DRAUGHT; AND CURRENTS OF HEATED AIR.

To understand clearly the movements of air induced by heat, it will be necessary to consider the following illustrations. Expanded air becomes lighter and rises, just as oil in water, or the heated particles of water in a boiler rise to the top. Air when warmed by coming in contact with a heated object, or warmed by radiation therefrom, becomes expanded bulk for bulk accordingly. Rising upwards, it is replaced by colder and denser air near it; this is in its turn heated, expansion continually takes place, and an upward current is the result; a rush of cold air follows from the space around it, and thus there is a continual current upwards from the heating object so long as any inequality of temperature exists. Thus in Fig. 1,



Fig. 1.

where a lighted candle is the heating object, the current upwards, as shewn by the dotted lines, is maintained, while the colder air rushes from around, as shewn by the arrows. The effect, then, of a candle, burning fuel, etc., is to draw, from below and around, particles of cold and dense air, expanding and ascending, as in their turn they become heated. The velocity of ascent depends upon the degree of heat of the currents. If cold air come in contact with them, the temperature being reduced, the ascending power will be much diminished; it follows that the more confined the ascending currents can be kept (consistently with free space to move in), the more certain will be their upward flow, and consequently removal. Thus if the candle be placed at the bottom of the tube (see Fig. 2), a quicker rush from below of the colder air will ensue, inasmuch as the heated currents not being accessible to the cooling influence of the external atmosphere, attain a higher temperature; which is accompanied by a corresponding difference of specific gravity, and consequently greater velocity. If the tube be of dimensions proportioned to the heating power, so as to give free space, but not more, to the ascending currents, the upward velocity will be greater than in a tube of larger dimensions. In practice it is found as indicated in theory; that as the products in a narrow tube are less easily cooled by the surrounding atmosphere, the temperature is higher, and velocity is quicker, than in a large and wide tube.



Fig. 2.

The altitude of the tube exercises a very important influence on the velocity of the upward currents. The higher the tube the greater the velocity; a column of four feet rises with twice as much force as one of two feet, and so on in the same proportion. Dr. ARNOTT (p. 403, *Elements of Physics*, 8vo. Lond. 1828) observes justly, that "as two or more corks strung together and immersed in water, tend upwards with more force than a single cork; or a long spear of light wood allowed to ascend perpendicularly from a great depth of water, acquires a velocity, which makes it dart high above the surface; while a short piece under the same circumstances rises very slowly."

Another thing, which influences the rise of heated currents in a tube or chimney, is the degree of heat which is imparted to the air. This will be seen to determine the amount of dilatation or expansion, which causes it to ascend. Thus in an open fireplace, the air finds entrance to the flue, above as well as below the burning fuel—mixing with the hot air ascending directly from the burning mass, it reduces its temperature and consequently its ascending force. If the air, by stopping up the open front of the fireplace, is forced to pass through the ignited fuel, it is so very much raised in temperature, that the velocity upwards is materially increased.

Descending currents can be maintained by the power of fire draught. Thus in Fig. 3, the cold air descending *b*, to supply the

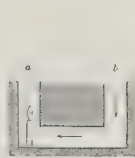


Fig. 3.



Fig. 4.

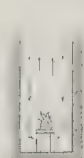


Fig. 5.

demand, ascends *a* heated. Again in Fig. 4, a fire placed at the bottom of a pit draws its supply of air from above. Fig. 5 is an exemplification of the upward currents produced in an open fireplace. If the chimney be very wide, Fig. 6, or if the supply of air from below be defective, the fire draws its supply down the chimney; then there are in such cases two currents produced, one up, the other down, and the ascending current coming in contact with the descending cold current is reduced in heat and velocity of ascent. If an aperture be made in the side of a flue, as at *a*, Fig. 7, a current will be established through it; the upward force of

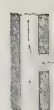


Fig. 6.

the draught in the flue carrying the air from the aperture up the interior of the flue. If the reader has carefully noticed the foregoing illustrations, he will be prepared to understand the following suggestions.

In determining to produce the ventilation of an apartment, or suite of apartments, by means of fire draught, the plan to be adopted will depend upon one of two ways, viz. either the construction and maintenance of fires or furnaces, whose air, to support combustion, must be drawn only from the apartment to be ventilated, the connexion being kept up by means of flues, shafts, or pipes; or by taking advantage of the upward current of some flue or furnace chimney, which may already be in contact with, or placed near the building. Thus in the case of a small steam engine connected with a warehouse, pipes may be led from the interior of each apartment, communicating with the interior of the flue of the engine furnace.

In the former case, the fireplace or furnace should be placed at the *lowest* part of the building, erected in a separate chamber, carefully made fire proof; or placed at the bottom of the upright chimney or flue, prepared to carry off the products of combustion. If the safety of the building and the other arrangements will admit of it, it would be better in all such cases to have the furnace at the *highest* part of the building. The benefit to be derived from this arrangement, although obvious, may be here

stated; the natural course of heated air being upwards, greater force must be maintained to cause it to take a downward course; in one case it must be controlled, in the other merely assisted. It is clear that as the fire is the power in both cases, a larger expenditure of fuel will be necessary to maintain currents opposed to, than others in accordance with, natural laws. But fortunately, air, if finally allowed to escape by an upward course, can be led horizontally, laterally or downwards, always however be it recollected taking a greater power in such cases. Fig. 8 will illustrate the manner in which the currents are produced by fire draught; the fresh air is introduced at the floor, and ascending to the ceiling, as at *a*, it passes through the space between the ceiling and the roof, through apertures made in the former; the fire at *c* draws its supply of air solely from the flue or passage *b*, producing a current downwards, which in its turn acts upon the air within the space *fd*, withdrawing the air therefrom, and consequently (through the apertures in the ceiling) the air contained within the apartment. Care should be taken to have the spaces into which the air is drawn, not larger than is essentially requisite. Thus where the space between the roof and ceiling of a building is very large, it would be better to have the apertures in the ceiling through which the air is to be withdrawn, made in the centre in a line with one another. A wooden box should then cover all these, running along the ceiling, closed at one end, and communicating at the other with the descending flue leading to the furnace. The double line *d*, Fig. 8, shows the position of this box, and the mode of preventing the foul air from spreading in the upper part of the space.



Fig. 8.

In a suite of apartments, the apertures for the withdrawal of the foul air should be made at the connection of the cornice with the ceiling, or as near the ceiling as possible, communicating with flues made in the walls; the whole of which should lead into the large descending flue. Instead of making an aperture along the cornice, as above named, an opening, circular or otherwise, might be made in the ceiling of each apartment, leading by a small passage to the great flue.

In making provisions for the withdrawal of the foul air from a large apartment, the apertures near the large flue should be less in number, or of area, than towards the end furthest from it. The reason for this arrangement is, that, as the withdrawing force of the flue is greater near its influence than when further from it, a greater area is requisite the further the apertures are from it, less being drawn through them in a given time.

All apartments should be largely supplied with pure air, *i. e.*, not less than four cubic feet per minute for each individual. It should be admitted at the lowest part of the chamber. In rooms having an outside wall, apertures might be made communicating with the space behind the skirting, or led beneath the flooring, to some convenient space where a grating may be placed, or small apertures bored in the flooring. In all cases the air should, on entering, be as much diffused as possible; this may be easily effected by placing before the apertures sheets of zinc perforated with small holes, horse-hair, or cocoa-fibre cloths. The smaller the interstices, and the more diffused, the less palpable will the current be.

In place of supplying each apartment with air through apertures in the outside walls, the corridors or passages may be furnished with fresh air, from which the rooms can be supplied; to effect this, a slit or opening may be made in the partition, or at the foot of the door; the best way, however, would be to lead air beneath the flooring, communicating through apertures in the centre of the room, or at the skirting-board.

In ventilating so large an apartment as a church, the fresh air can be admitted easily through apertures in the outer walls; these should be placed on all sides, and be furnished with valves (hereafter figured) as regulators. The air flues should have small zinc frames, attached within a few inches of the entrance, these frames being provided with sheets of finely perforated

zinc, which can easily be removed from time to time, in order to be cleansed. Immediately behind the frame, the air flue may be enlarged; this will check the velocity of the passing current, and supply a vacancy, in which the extraneous particles of dust may be lodged. The air can be most conveniently carried to grated apertures in the passages or aisles; yet if it be required to have a greater diffusion of the air, the most effectual plan will be to have a dry chamber beneath the whole extent of flooring, well supplied with air, and the flooring-boards perforated with innumerable small holes; the smaller these are,

the better will the air be diffused. If this plan is adopted, it will be essentially necessary to have the air heated in cold weather. (HEATING.)

As in all cases there is a loss of power where a descending current is established, the used air may be led in the case of a

church with a turret, to the inside thereof, by means of a ventiduct. The withdrawing power to be placed here will be best supplied by a "gas rarefier", which, if of sufficient size, will act very powerfully. Fig. 9 illustrates this mode of ventilation, where *bb* is the ventiduct, *a* the gas rarefier; the fresh air is admitted near the flooring.

Fig. 10 illustrates the maintenance of a descending current by means of a gas rarefier; the fresh air is admitted to the various apartments at *aaa*, the vitiated is withdrawn through apertures at the corners, as at *bbb*: *c* is the gas rarefier.

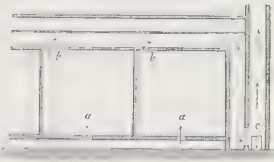


Fig. 10.

At the Unitarian chapel in Hope Street, Liverpool, and all other places where this gas rarefier has been adopted, it has been most successful. In place of it, if a congeries of pipes connected with steam or hot water apparatus be placed in the ventiduct, an upward current will by this means be created, and maintained so long as the heat is kept up. The pipes may either be coiled spirally in the interior of the shaft or turret; or, as in the plan recommended by Mr. Sylvester for the House of Commons, they may reach across the space formed between the roof and ceiling. In large buildings, where a steam-boiler is used, the plan of ventilating by means of a steam-jet, or jets, may be adopted with advantage; it is a very simple and effective mode of withdrawing foul air. High-pressure steam is projected upwards in the interior of a shaft, through small jets or pipes; the heat, acting on the surrounding air, rarefies it, and causes it to ascend; and the friction of the steam also acts upon the air, just as a small stream of water, projected forcibly through a body of water, carries along with it a considerable volume, or as the jet in a locomotive engine, increases the draught. But there is yet another cause, by which the efficiency of a steam-jet as a ventilating power is maintained. The steam, on issuing from the jets, does not spread itself in all directions, without assuming a determinate form; but it expands conically, the base of each inverted cone occupying space in the shaft, and acting somewhat as pistons to push up the air. But the writer is inclined to think that the jet obtains its efficiency, chiefly from the friction it has with the surrounding air, and from its contained heat rarefying the air with which it comes in contact. Mr. Tomlinson (*Warming and Ventilation*, p. 241, 12mo. London, 1850) points out a plan, by which a suite of apartments may be ventilated by the heating power of hot-water pipes; it appears to possess peculiar advantages, but will require to be adopted in the original construction of the building. Flues are to be left in the walls, and provided with communications opening to each apartment near the ceiling; the egress of each flue

is to be at the top of the house, and each carefully guarded at top, to prevent rain, etc., descending. It is evident that the heat communicated by the pipes placed in the interior of the flues, will cause an upward current therein, and consequently the air in the apartments will be withdrawn through the openings. In summer time, when the range of pipes placed in other parts of the building, are not in use, stop-cocks may be provided, by which the hot water will be confined to the pipes in the flues. By this arrangement, a continual withdrawal of air will be going on at all times, the expense of keeping up the heat being exceedingly slight. Gas rarefiers may perhaps be cheapest in ascending flues, and most conveniently fitted up at first; although steam or hot water pipes would require no attention and be very safe. If gas is used, care should be taken to have it placed in a fire-proof chamber, having no near connexion with wood.

Having thus concisely explained the principles of ventilation as maintained by exclusive furnaces or heating powers, we have now to consider the best means of taking advantage of casual sources of fire-draught, as chimney flues. The most celebrated adaptation of the working power of a chimney flue is that of Mr. Fleming of Glasgow, who successfully ventilated a long range of buildings, called the Barracks, occupied as dwelling houses by factory workers. In this place, before the ventilating arrangements were adopted, fever was scarcely ever absent, and the mortality amongst the inhabitants very great. The plan adopted was simple. A pipe communicating with the interior of the flue of the factory furnace was led from the interior of each room near the ceiling. From the rapidity of the draught in the chimney, the air was very speedily withdrawn from the range of apartments.

In large buildings where there is a fire-place or furnace used in the lower part of the building for heating purposes, advantage should be taken of this power for ventilation. The simplest mode of doing this, is to lead a pipe from the space between the roof and ceiling of the large apartment, or from the flue into which the foul air passages meet, down to the ash-pit of the furnace. To prevent the air having access to the fuel through any place, save this pipe, the furnace-door should be made as tight as possible, and the open space in front of the fire leading to the ash-pit, covered in with an air-tight cover. This should be made so as to be easily removed, to stir the under part of the fuel when necessary, and yet perfectly air-tight, or as nearly so as possible, when put in its place; as the fire will draw down its supply of air through the pipe alone, the suction then through it will be of considerable force. Unless the furnace is very large, the force of the downward current in the pipe will only suffice for a moderately large apartment; the plan may, however, be adopted, as a valuable auxiliary to other ventilating arrangements.

The most effectual plan of taking advantage of the full working power of such a furnace, will be as follows. Let the room, in which the furnace is, be made as small as possible, consistently with convenience for adjusting the fuel. Let the door of this room be also as small as possible, and be made to shut perfectly air-tight; and let the air which is to supply the furnace come only through a flue, having communication with the apartment to be ventilated: the furnace, being supplied solely through this flue, will exert its utmost withdrawing force.

If the reader will turn to Fig. 7, he will see how an upward current can be established, through an aperture made in the chimney above the supporting fire. It is on this principle that air can be withdrawn from apartments by openings, or by pipes communicating with openings in flues. In ventilating apartments in dwelling-houses, etc., advantage should always be taken of the controlling power of the chimney flue. The apartment should in the first place be well supplied with fresh air; for this purpose, apertures may be made in the walls, or the supply may be taken from the corridors or passages, as before described. In using the ascending power of the currents in the chimneys of apartments, the great desideratum is to have

the aperture so arranged as to prevent the smoke issuing into the apartment. From the defective construction of fire-places and chimney-flues (CHIMNEYS), down draughts are of very frequent occurrence, it therefore becomes necessary in adopting foul air apertures, to use such only as will prevent the smoke from entering the apartment. Dr. Arnott's ventilating valve for apartments is well known. It may be briefly described as a square tube of iron, inserted in the wall near the ceiling of the apartment. The tube communicates with the interior of the chimney-flue; thus making a passage from the interior thereof to the apartment. At the end of the tube nearest the apartment, a valve of a peculiar construction is fastened. This valve opens inwards, admitting air to pass it from the apartment, but closes when smoke is forced along the tube from the interior of the chimney. Fig. 11 is a representation of the principle of the valve; where *a* is the valve, the arrows shew the manner in which the currents act upon it; *bb* is the wall; *c*, the tube. If a tube without the valve be placed in the wall above the fire-place, as near the ceiling as possible, it will be effectual in withdrawing the air from the room, if the chimney is properly constructed so as to prevent down draughts. If a simple tube be used, the mouth of it could be masked by open ornamental work. The following is a sketch of a room ventilator recently introduced by Mr. Wm. Bryden, of Edinburgh. Fig. 12



Fig. 11

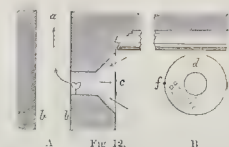


Fig. 12.

shows the two views of the ventilator. A hole is cut, near the ceiling, in the wall of the apartment to be ventilated, communicating with the flue above the fire-place; in it is inserted a conical or funnel-shaped tube, as shewn in the illustration A. At the side in the room is placed a lid, hinged as seen in the elevation B at *g*, and kept close by a button, or clasp, at *f*. At the centre of this lid, exactly opposite the small or straight part of the tube, there is a solid part, of the same diameter, at *c*; this solid part should be a little larger than the smallest part of the tube. The remainder of the lid between the two concentric circles, as at *d*, is punctured full of small holes; the aggregate area of which should be equal to that of the straight part of the tube. The upward current in the flue, *a*, draws the air from the apartment through the apertures *d*, as shewn by the arrows in the sketch to the left. If there should happen to be a down-draught in the chimney, the smoke passes along the tube and is thrown against the solid part *c*, and spreading up in the funnel part is carried back again to the chimney by the force of the renewed current. Where good precautions are taken to prevent down-draughts by the proper construction of chimneys, a better contrivance could not be adopted than this. It has been perfectly successful in all cases where adopted. In the summer the current may be forcibly maintained by having a gas jet burning, as seen in the sketch; this will not be expensive, not observable in the room, and render the plan thoroughly efficient at all times. In a well constructed chimney no down-draught will take place, and a simple tube without any valve will act well in withdrawing vitiated air from any apartment.

The reader will perceive how easily the apertures of all those contrivances can be ornamented, and made to add to the decorative appearance of the apartment. In place of apertures in the wall of the apartment, as above described, a tube may be concealed behind the cornice leading to the chimney; or a passage or flue may be made in the interior of the stucco-work. In either of these plans, the slit or opening leading from the apartment to the interior of the tube or passage, should be of less area near the fire-place than further away from it. If a tube is used, it may be carried a few feet up the chimney; and then, it being considerably heated, the ascending force of the interior current will be materially assisted; a cap of a simple

construction may be placed at its termination to prevent soot falling down it.

Another plan is to make in the centre of the ceiling a circular space, of diameter proportionate to the size of the room (say, for a room of 14 feet square, 10 inches diameter); this may be made some three or four inches deep, arched or curved on the upper side. From the side of this aperture, a pipe or tube may be led to a flue made in the wall, leading to the external atmosphere. If the joists run transversely to the length of this pipe, holes will require to be cut, to allow of its passage; but as in London, and most country houses, the joists are not deep enough to allow of this being done, there will be a limit to this plan. If the trimmer would allow of it, and sufficient space were left between the plaster and the beams, it would be a good plan to lead the pipe direct to the chimney-flue; but the practical difficulties in the way prevent this being done, although in some cases it has been effected by Mr. Gilbody of Manchester, by leading the pipe through a hole cut in the trimmer. Mr. Walker of Manchester, has recently registered a "ventilating chimney tube", which promises to be useful (for full description of this plan, see CHIMNEYS); it consists of a tube of earthenware, the usual size of a chimney-flue, but with the corners rounded; at one side a tube, of length equal to side of flue, but in breadth much smaller, is attached, or rather moulded in the same piece; the side of this flue is formed by one of the sides of the smoke-flue. The heat of the smoke, etc., is communicated to the smaller flue, the air therein is rarefied, and an ascending movement is the consequence. It is evident, that if an aperture be made, communicating with the interior of this flue and the apartment to be ventilated, an upward current of air will be the result. It is obvious that this idea is susceptible of being carried out in various forms, according to local circumstances.

From the examples thus given, there should seem to be no difficulty in ventilating any public building or private apartment; and if any of the modes stated do not seem convenient to be adopted, yet the principles upon which success depends being so plainly laid down, the architect will easily design others, which will meet the circumstances of the peculiar case to which he may wish to apply them.

MECHANICAL VENTILATION BY MEANS OF FANNERS AND SCREWS.

As the arrangements regarding flues and passages are the same as those rendered necessary for ventilation by fire draught, it will be necessary to dwell but very shortly on this branch. Instead of sustaining the currents by means of fire, the machines above indicated are used. There are two plans in which they are adopted; these are what are called the "plenum" and "vacuum" impulses. The former is where the power of machinery is used to force fresh air into the interior of an apartment, the foul being allowed to go out by crevices, or through apertures made in the apartment. The latter is where machinery is used for withdrawing the foul air, the fresh being allowed to enter through apertures made for its admission; fire draught acts upon the vacuum impulse.

The fanners have long been in use; they were described by DESAULNIERS (*Course of Experimental Philosophy*, vol. ii, pp. 563, 568; *Philosophical Transactions*, vol. xxxix, No. 437), and have since been made in a variety of forms. The form shewn in

Fig. 13 is that most commonly used, and is very effective; *b* is a side view; *a* a sectional plan. All fanners draw in air at the centre, and discharge it at the circumference; this is shewn by the arrows in the sectional plan. Fanners are also made with curved blades; but there is yet much diversity of opinion relative to the best form of these portions. Some practitioners hold that much advantage is derived from the use of curved blades. The sides of some fanners are entirely open, drawing

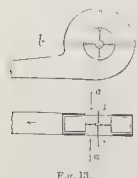


Fig. 13.

in air on each side of the blades, instead of through an aperture in the centre, as shewn in Fig. 13. The circumference of others is also left open. This latter form of fanner is very powerful in discharging air.

There has recently been patented, a very important improvement in the fanner, by Mr. Lloyd of Southwark. Fig. 14 shews the form of blades, differing materially from those generally used. The tapered blades *a b a* are attached by rivets *c e* to the arms *d*; the blades, instead of being flat, are curved, forming portions of a spiral. The blades are of the ordinary width at the central holes, but taper to a breadth not more than from one-sixth to one-twelfth of that width, according to the purpose for which the fan is required. Conical-shaped side-plates of sheet-iron are accurately fitted to all the edges *a b* of the blades, forming an inner case, with a central hole in each for the admission of air, and a space betwixt their peripheries, the same width as the tips of the blades, for its discharge into the outer or usual case.



Fig. 14.

In the ordinary fanners, the blades are of a square form, as wide at their tips as at the centre, and are not attached to any internal case. Now, as the spaces betwixt the blades continue to increase from the centre outwards, it is clear that the air which is drawn in at the central holes, will not be sufficient to fill the larger space, the circumference of which is described by the tips of the blades; it therefore follows that there must be more or less of a vacuum formed behind each blade when revolving, and that the air which is condensed in front, will rush over the ends and sides of the blades, to fill up the vacuum so formed. It is this process continually going on, when the ordinary fanners are working at a high velocity, which causes the disagreeable humming so frequently complained of. In the improved fan which we have above described, however great the velocity, no disagreeable noise is produced; a fan fifteen inches in diameter, and revolving 1500 times per minute, is perfectly noiseless. This noiselessness is caused by the opening in the periphery of the inner case, not greatly exceeding in area that of the nozzle of the discharge-pipe; the air consequently passes quietly and smoothly through the passages, the side-plates preventing any reflux of air upon the blades. No power is lost by beating or "grinding" the air, which happens in fanners of the ordinary description, revolving at high velocity; as the blades gradually decrease in width to the tips, where their velocity is increased. It is asserted by the patentee, that the result of repeated trials, in the presence of many scientific gentlemen, fully proves that, compared with other fans, size and other circumstances being alike, the same intensity of blast is kept up by the improved form, with the expenditure of half the power required to drive the former. A fan of the improved construction, fifteen inches diameter, revolving 1500 times per minute, will throw in air at the rate of 500 cubic feet per minute. A fanner of twenty-five inches diameter, the velocity of periphery of inner case being 11,000 feet per minute, keeps up a continuous blast through a nozzle, the area being fifty inches, supporting a column of water four inches high. The form of fanner above shewn in Fig. 13, has its outer case concentric with the tips of the blades; the improved form, called the "eccentric", discharges more air than this, inasmuch as, in consequence of the central axis of the fan, being out of the centre, of the outer case, a large space is left at the back, into which the air is compressed in the spiral course by the revolving blades. In the concentric form there is considerable loss of power, from a quantity of air being carried round by the blades, in place of being discharged at the orifice in the circumference. When fans are used for withdrawing air, the openings at the side are inclosed within caps, with which the tubes from the ventilating flues communicate, the area of these apertures being of course, in all cases, equal to the area of the flues. Valves may be placed, for regulating the withdrawing

or blowing power, in the pipes or flues, or in the caps at the sides of the fan. There is no part of the subject of ventilation about which so little is known, as data of the working of fanners and screws. Each practitioner has his own plan; some recommend screws, others fanners; and in no instances scarcely do two parties agree as to results found. If the experiments with fanners instituted by some were to be given, it would involve the mention of all others; this would be a matter of some difficulty, and would occupy larger space than may be considered necessary. As a guide in the calculation of size of fanners, the following extract from Mr. Tomlinson's work (p. 189) is given, as it possesses the advantage of containing much information in little space:—"The fan produces its greatest effect, when the extreme points of its leaves move through about eighty feet per second. The mean velocity of that portion of the vanes by which the air is discharged, is about seven-eighths of the velocity of the extremities; but owing to the inertia of the air, there will be a loss in the velocity of the issuing current, which will increase with the increased speed of the vanes; so that, in general, the current will be discharged with a velocity equal to about three-fourths of the velocity of the extremities. This velocity, measured in feet per second, multiplied by the area of the discharge-pipe in square feet, will give the number of cubic feet of air discharged per second. If the effective velocity of the vanes be seventy feet per second, and the sectional area of the discharge-tube be three square feet, then $70 \times 3 = 210$ cubic feet of air discharged per second, or 12,600 cubic feet per minute. As a cubic foot of air weighs 527 grains, there will be about 13 cubic feet of air to a pound; therefore $\frac{210 \times 60}{13} = 969$ lbs. weight of air set in motion per minute, with a velocity of seventy feet per second. The height from which a heavy body must fall, in order to acquire a velocity of seventy feet per second, is 76.5 feet, which multiplied by the number of pounds weight moved per minute, will give the power necessary to discharge this quantity of air at the stated velocity; and this product, divided by 33,000 (the number of pounds weight that one horse will raise one foot high per minute), will give the amount of steam-power required. Therefore $\frac{76.5 \times 969}{33,000} = 2.24$, or nearly $2\frac{1}{4}$ horse-power, will be required to discharge the given quantity of air at the velocity stated." But it is needful to observe, that both theorists and practical men are found to disagree considerably among themselves, as to the effective results of any form of these machines. It may also be added, that a ventilating screw, four feet in diameter, revolving four hundred times per minute, is estimated to deliver four thousand cubic feet of air in the same space of time; the power required being equal to that of two horses, according to Watt's formula.

Various modifications of the Archimedian screw have been adopted for ventilating purposes. Mr. Combe, late of Leeds, has introduced, with great success, a double threaded screw in Messrs. Marshall's cloth factory in that town. Screws, as well as fanners, can be used for extracting or forcing air, according to the direction in which they are made to revolve.

In determining to adopt the fanners for forcing a supply of air into apartments, it should be borne in mind, that it is the quantity of air that is required, not the velocity with which it is propelled; that the larger the channels made for the purpose of leading the air to the place required, the better: that large fanners are worked with greater economy than small ones; and that it is a general rule, that more satisfaction is attained by working with large fanners at a slow speed than with small ones at a considerable velocity. When small fanners are wrought at a high speed, a very disagreeable noise is created.

Care should be taken to have the apertures for the discharge of the foul air of sufficient size; in a church or similar building these can communicate with the external air, through the common shaped louvres on the roof; or the air may be led to the turret or spire. In using fanners to withdraw the foul air (that is, by the vacuum impulse), the channels leading from the highest part of the building should all lead into one large flue,

which may descend in the same manner as in fire-draught ventilation; but such a plan will require additional exhausting power. To have the full advantage of the machine, the better place would be near the roof, at some position higher than all the air channels leading from the apartment beneath. The fanners could, however, be easier wrought near the ground, and this convenience may be considered worthy of being attained by providing additional exhausting power.

The annexed figure shews the arrangement for forcing in air to an apartment. *a*, is the fanner propelling the air beneath the floor, through which it passes by apertures made therein. The vitiated air is forced up by the current through the ceiling, and out at the louvre shaped opening, *c c*, to the external atmosphere.

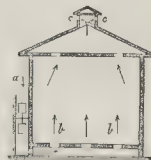


Fig. 15.

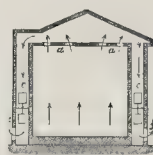


Fig. 16.

The next figure shews the arrangement to be adopted for extracting the foul air by means of the fanner *c*, placed at the bottom of a flue. The air should only have access to the centre of the fanner, or the size should be proportioned to the size of flue; if this is the case, so as to allow no air to escape but through the influence of the fanner, and the circumference be left open, the utmost effect will be obtained. The size of the fanner will depend upon the width of flue; and the rate at which the vanes revolve, as shewn above; if the air is led to the centre by caps and pipes, the area of these must be equal to the area of the flue. The size of fanners must be left to the decision of the architect, as to whether he will prefer to carry off the same quantity of air by small fanners working at a high velocity, or by large ones working at a slow speed. The discharged air passes out from the chamber at *a*, along the space between the roof and ceiling, down the flue, drawn in by the action of the fanners, and finally discharged to the external atmosphere at *f*. In each of the arrangements thus indicated, the screw may be adopted in place of the fanner, yet, from the certainty and simplicity of its action, and the satisfactory results generally obtained from it, the adoption of the fan may be recommended. Mr. Walker of Manchester has recently invented a direct action engine of extreme simplicity for working screw ventilators; but it may of course be applied to fanners. Dr. Arnott has invented a species of pump for supplying fresh air to apartments, which when judiciously constructed and worked, is very efficient. It may be briefly described as a pump having large cloth valves; the rate of speed is moderate, but from the extensive surface of the valves generally adopted, a large quantity of air is sent into the apartment. *a a a a* is the external casing, containing the internal cylinder or pump *d d d d*, in which the piston *c c* works; the partitions *f f* make four divisions, each provided with one, two, three, or more valves, one set of which open inwards, the other outwards; as the air is entering by *e*, it is projected through *k*; on the piston descending *k k* close, *e e* shut, and the air beneath, prevented from going out by *e e*, passes through *g g*, the air entering above the piston by *h h*. The ease with which it may be worked, and the cheapness of fitting it up, as compared with fanners or screws, will be evident. A large pump of this description may be made for a few shillings; the quantity of air which it delivers is exactly proportional to the cubical contents of the pump and the rate at which the piston *b* works. In the one fitted up at the House of Lords, worked by a small direct-action engine, the size of the pump is 8 feet square, having a sectional area of 64 feet; the sizes of the side-valves, 9 inches broad; in length, equal to the length of side of pump: the piston of wood, working easily, makes fifty strokes per minute, delivering, in that time, 12,800 cubic

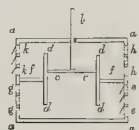


Fig. 17.

feet of air—one-third being deducted on account of friction. The side valves are made of oiled silk, lined with green baize.

An opinion prevails to a very considerable extent amongst practical men, viz., that fanners are more powerful in exhausting than propelling air. That this is not the case, a moment's reflection will abundantly prove; they only exhaust what they propel; what is forced out at one side is equivalent to the quantity drawn in at the other. The power of exhaustion and propulsion is therefore in all cases equal.

Wherever machinery is proposed for adoption, the vacuum impulse has strong claims to recommendation. Parties have advocated the plenum impulse not only from the unity of atmosphere which it develops in the apartment into which it is introduced, but also from the superior advantages which a dense atmosphere is supposed by them to possess over that which is comparatively attenuated.

REID (*Illustrations*, p. 121) observes, in answer to these arguments, that "the mere density of the air supplied in any ordinary building cannot, however, I apprehend, be a matter of any real consequence, as whatever density may be given to air by machinery, or in the leading air channels immediately attached to the pneumatic machine employed, it is not practicable to communicate any considerable increase of density in any apartment at a reasonable expense, so long as communications with the external atmosphere by doors or otherwise are not placed on a very different footing from what they are at present; nor, when the fluctuations of the barometer are so considerable from day to day, can it be supposed that any action less in intensity than what is continually produced by this cause, can be likely to exert any very sensible effect, while at the same time, it is not unfair to conclude that the pressure which actually obtains at the surface of the earth must be considered the best for the maintenance of health and strength both of body and mind."

VENTILATION BY MEANS OF NATURAL CURRENTS.

Natural, as opposed to artificial, ventilation (understanding by the latter term all plans requiring arrangements, of whatever nature, to be constantly and exclusively maintained), may be defined—the maintenance of currents in the air of apartments by a process similar to that by which movements in the external atmosphere are created and upheld. It has already been shewn "that the specific gravity of air vitiated by respiration or combustion (the two great processes that deteriorate air in ordinary buildings), is under ordinary circumstances less than that of common air; it gives way accordingly, and is pressed up by the purer and denser air." If the reader will turn to the preliminary remarks, in the first division, upon the modes in which heated currents are produced, he will find that air when heated becomes expanded, and that its upward force depends upon the temperature and consequent degree of rarefaction or expansion. Air when expelled from the lungs is heated (this heat is principally that which is derived from the animal heat of the body), it therefore has an upward tendency. The sooner air, then, is withdrawn from the room in which it is vitiated the better; and the more certain will its withdrawal be, if this is effected before the temperature is reduced. If these remarks be understood, the reader will perceive the truth of the following explanation of natural ventilation; and the benefit to be derived from carrying out the suggestions thereafter given. "Imagine," says REID (*Illustrations*, p. 92), "an apartment occupied (not inconveniently crowded) by a number of persons standing on a porous floor, and the roof taken off; at ordinary temperatures the air vitiated there by the human frame requires no mechanical power to remove it. The superincumbent pressure is diminished by the expansion of the air as it is heated; but the external atmosphere is permitted to have free access below as well as above, to the porous floor. Its power therefore preponderates, and an upward movement is the necessary consequence, which is accompanied by the introduction of fresh air, and the removal of that which

is vitiated. Here, then, is a species of natural ventilation. All that is essential is merely this, that the natural movements induced by the heat of the body shall not be stopped by any barrier which may be opposed to them. An open roof and ceiling, however, is in the greater number of climates indispensable. Protection is required from the weather independent of other arrangements, the opening accordingly may be contracted. In proportion to the amount of contraction, the temperature of the air, and the numbers on a given space, it now becomes necessary to increase the velocity of the discharge from the apartment referred to. To effect this, if a shaft or chimney be extended from any opening in or near the ceiling, the column of warm air which soon fills it increases its power: and, unless an extreme number of individuals be crowded in the apartment, the shaft is sufficient for all ordinary purposes. It acts at all times when the density of the air within is less than the density of the air without; and when this is not the case, its power can still be developed by kindling a lamp or fire, or *merely by increasing the temperature of the apartment* for which it is supplied, as any of these cases produces the necessary diminution of density or rarefaction within, on which its force depends." Too much attention cannot be paid to this excellent illustration; if it be thoroughly understood, all the necessary arrangements will be easily made out.

In ventilating public buildings by the system of natural ventilation, the first important requisite is the admission of fresh air. The apertures for its admission should be made in the walls as near the bottom as possible. If there is an unoccupied space below the flooring not damp, the air may be allowed to disperse itself there, finding access to the buildings through apertures in the flooring. If this plan be not approved, or if any chamber be beneath the apartment to be ventilated, the fresh air should be led to the passages through pipes or boxes leading from the apertures made in the outside walls. Gratings should be put at the openings to which the air is led, placing at the under side of them plates of finely perforated zinc to diffuse the air as much as possible. As in some cases, from the nature of the ground at the foot of the walls, the air there is not well fitted for respiration, it is better to draw the air from the top of the walls. The following sketch (Fig. 18) shews how this may be done. In the walls lead up hollow passages or flues, as *c c*, communicating at the top with the external atmosphere, and at the bottom with the space below the flooring, or with the boxes or flues leading to the passages, as shewn at *d d*. The inside of these internal "flues" should be as smooth as possible, and have easy curves; circular stone-ware pipes can be used with advantage for such purposes. There is considerable friction in rough stone flues, so that the smoother they are, the better will the purpose be answered. The apertures for the admission of fresh air should be provided with valves capable of being opened or shut to any extent or required degree. The following may be cheaply made. Supposing the size of aperture to be 12



Fig. 18.

inches by 8; a zinc box of size sufficient to slide tightly into the aperture should be provided with a lid of zinc, fitted so as to move easily in the inside of this box; the lid should move on a central bar, and be exactly balanced. Fig. 19 will shew at once the nature of its construction; *a a* is the wall, *b b* the valve or lid balanced on the centre *c*. By moving the lid to any required angle, the amount of opening may be regulated. The apertures at the top of the wall may be provided with valves of the same construction, slightly altered as follows; the upper side may have a bar of lead placed in the inside; this will make the valve have a tendency to fall towards the under side; to prevent this, but still to make the movement forcible yet controllable, attach to the centre of the upper side of the lid and outside, a long



Fig. 19.

bar, having at one end a small cord; this may be fastened to the wall beneath, and loosened or tightened, according as the valve is required to be moved. A variety of valves might be described; but we are of opinion that it is needless to take up room therewith, inasmuch as the architect will have no difficulty in designing any required form.

In supplying fresh air to apartments, it should be carefully borne in mind that *fresh air should never be admitted above the zone of respiration—always beneath it.*

This decided opinion, excluding all openings in windows used for admitting fresh air, disagrees with that of many practitioners, who recommend and adopt "window ventilators" and apertures for the admission of fresh air, placed above the zone of respiration; but in order to arrive at a right understanding on the matter, the following remarks are offered to the reader's consideration. Already it has been shewn that the course of foul heated air is upwards, and that it is forced in that upward ascent, by the pressure or superior density of the cold air beneath; this being the case, there is no utility in admitting cold air to press on the top of a stratum of hot air, or to mix with it. Again, plans for warming the cold air admitted by windows or wall apertures, have been introduced, by which the air is made to project upwards, and mixing with the heated air, is raised in temperature; the cold air thus admitted will certainly be warmed, but then two striking disadvantages will occur; the foul air, being reduced in temperature, by the admixture of the cold air, will also be reduced in ascending velocity, and the cold air (admitted for the purposes of respiration) mixing with the foul air, must of necessity be contaminated thereby. If the desideratum is to supply fresh and pure air to an apartment, it must be useless to admit it in such a way, as that the first operation is to reduce its purity. If the air is to be warmed, proper means are within reach by which it will not be contaminated. The plan of heating cold fresh air, by mixing it with warm contaminated vapour, is as erroneous and contradictory in principle, as it is inelegant in practice. It may be deduced that all window and wall ventilators placed above the zone of respiration are mere "make shifts"; and should be looked upon, at the best, as temporary expedients for overcoming difficulties occasioned by defective arrangements in the original structures.

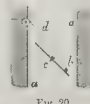
If other arrangements cannot be made (as in the case of some private apartments) for admitting fresh air below the zone of respiration, whether from local arrangements, or on the score of expense, necessitating the admission of fresh air through the windows, it should be as diffused as possible.

The ventilation of apartments in tropical climates is a matter of considerable importance. In Egypt, a contrivance anciently used for this purpose, consisted of a frame enclosed at the sides, but open at both ends, and divided into two compartments by a partition in the centre—the frame or box not being of the same depth or height throughout its length, but tapered from the ends towards the centre; the roof being thus angular, the wind, entering at the ends, was deflected into the passages beneath. The modern "*mul'ckuf*" is single, and in fact is only a sloping shed erected on the terraces of the houses, with its open mouth directed towards the north or north-west, to conduct these cooler winds into the corridors below. They are generally made of strong frame-work, filled in with planks; cheaper ones are constructed of reeds or mats, covered with stucco. In India the fan has been used for ventilating purposes from time immemorial; in some cases it is very large, the handle resting on the floor; yet by long practice the native servants have acquired wonderful ease and dexterity in wielding them. The chief effect obtainable by their use is, by giving motion to the air, to project a larger quantity against the body, and abstract therefrom a portion of heat. When a large room is to be ventilated, the contrivance called a punkah is adopted. This is merely a huge oblong fan, suspended in the direction of its length from the roof of the apartment, and moveable from side to side by hinges or suspending cords—a rope is attached to the under side

of the fan, and passed through an aperture in the door or wall; by pulling this rope, the attendant is able to communicate a pendulous motion to the punkah, waving it to and fro. Mr. Dobson, some years ago, invented a machine for imparting motion to the air of apartments in tropical climates. A case was suspended from the ceiling over pulleys, so that it could be hung at any elevation beneath the ceiling; this case was provided internally with two punkahs or fans, mounted in a frame, and crossing at right angles; rotatory motion was given to these by spring mechanism. By all these contrivances the vitiated air is only agitated, it is not cooled or purified in the slightest degree. Were apertures for the egress of foul air provided, and fanners, screws, or pumps used, injecting fresh air, any degree of pleasant and healthy ventilation would be obtained. As a machine easily worked, from the lightness of its internal mechanism, and as capable of throwing in any quantity of air, Arnot's pump (above described) would be eligible for ventilating apartments in tropical climates. The difference between the temperature of the air in apartments, and that of the external atmosphere in tropical climates being slight, the mere providing of exit and egress apertures, would probably not suffice to create that sufficiently rapid current of air, which the inhabitants of those countries consider so essential to health and comfort. By the use of a well devised system of egress apertures, and an efficient pump, the ventilation of any apartment would be easily attainable; the heat of the air sent in might be lessened, by passing it over cooling chemical mixtures, or through water. By having a simple arrangement of fly-wheel and crank, the power of a man could work—for many hours a day—a sufficiently large pump to supply a suite of apartments with a due amount of fresh and pure air. It is worthy of notice, that Professor Smyth has developed the construction of an apparatus for so compressing the air, that it shall enter the room at a considerable number of degrees below the temperature of the external air. A one horse-power machine "may be expected to furnish a room with about eighty cubic feet of air per minute, cooled 15° to 20° below the atmosphere outside. The room to be filled with cooled air, should either be surrounded by a wall, unbroken by doors and windows, to at least four feet in height; or, which would be the better plan, should be sunk that, or a greater depth, in the ground." The machine is fully described, and illustrated with a diagram of the apparatus, in the CIVIL ENGINEER'S AND ARCHITECT'S JOURNAL, vol. xiii, p. 300.

The most efficient mode of carrying away foul air will be to make apertures, of sufficient numbers and size, in the interior ceiling, or roof (if there be no ceiling); leading the air up by means of ventiducts to the external atmosphere. In cases where there is an inner space between the roof and ceiling, the vitiated air should be led through it in the ventiducts, and not by any means be allowed to spread in the empty space. The external air is always cooler than the vitiated air to be withdrawn from the building; that contained in the roof is cooler also, and, acting upon the vitiated air, reduces its temperature, and causes descending currents. No one, while wishing to withdraw water from one space, would allow it to spread itself over another, but would at once confine it in the appointed tubes: so in like manner it is wisest to withdraw vitiated air at once, and not allow it to spread itself in large spaces.

The vitiated air ventiducts should project some space above the ridge of the external roof, and be carefully finished at top, as will be seen in subsequent observations. They can be made most conveniently of wood, and should be air-tight. Valves should be provided in the interior, to regulate the egress of the air. The following is a sketch and description of one. At any convenient place near the entrance of the ventiduct, is put a valve, working on a central bar, *c*. When horizontal, it should be of sufficient size to fit the area of the ventiduct. At one side *b* it has a heavy weight or counterpoise firmly attached; to this fix a rope, chain, or cord, *d*, passing through a hole in



the side of the ventiduct over a pulley fixed in a bracket, fastened on the outside, along the space of the roof to the wall; entering finally into the interior of the building through an aperture in the ceiling, and continued to any part of the interior required. At the place where the cord passes down to the inside, another pulley should be fixed, over which the cord should run. To counterbalance the weight fixed in the valve, another should be suspended from the end of the cord in the interior. This weight could be made ornamental, and have a pointer projecting from its end or side. The weight should slide up and down between two upright slides, made of wood or metal, fastened to the front of a decorated board. On this board an index-plate should be fixed, having the words Open, Shut, Half, etc., painted thereon, at distances corresponding to the opening or shutting of the valve. The adjustment of the plate will be a matter of no difficulty. When properly adjusted, the pointer of the counterbalance weight at the end of the cord attached to the valve, should, when the valve in the ventiduct is shut, point to the word Shut, and so on. In fig. 20, *a a* is the ventiduct, *b* the weighted valve working on the centre *c*, *d* the rope or cord for working the valve. If open holes be objected to in the ceiling, pendants suspended some ten or eighteen inches beneath the opening, will mask the apertures completely. They should be carefully fastened by strong iron bars. The under parts of these pendants may be made highly ornamental. The air will pass round the upper edges, and enter the aperture of the ventiduct above. The opening, if left open (without the pendant), would have a tendency to draw away the column of air only immediately under it; while, by means of this pendant, the air is drawn horizontally, as it were, creating a horizontal current calculated to draw off the whole air near the ceiling. The diameter of the pendant should therefore be somewhat larger than that of the opening of the ventiduct.

Having mentioned that the ventiducts should be carefully finished at top, it remains to say that the contrivances used for this purpose are numerous. The moveable or revolving cowl or cap seems to be most used; but there are serious objections to this plan in public buildings. However well constructed, it invariably makes a noise, which is heard in the building below; moreover, like all moveable constructions, it is liable to get out of order; its efficacy being in such an event completely impaired. Stationary tops are therefore preferable. The desiderata for all such contrivances are, means of obviating down-draughts, and the descent of rain, snow, etc., and facility for admitting the egress of the foul air. An excellent top, shewn at *c*, Fig. 21, recommended by TREDGOLD (*Principles of Warming and Ventilation*, 8vo, Lond. 1836, p. 92), has been largely used: the stronger the wind blows, in passing over this top, the more it causes an upward current in the ventiduct, materially assisting the natural ascent. *a* is the top, to prevent rain etc. from falling down the tube; it is here shewn flat, and only held in the pot by three legs, differing in these respects from Tredgold's, according to the improvements adopted by the late Mr. Papworth, which allow of its regulating the quantity of open space, and if pushed off by accidental means, a chain of sufficient length prevents its hurting the roof.



Fig. 21.

The common louvre-shaped openings may, if constructed well, be useful to a certain extent; if they could be used circular, they would answer better. These and the top above described, can be covered on the outside by ornamental boxes, corresponding with the style of architecture of the building on which they are placed, made in such a manner as not to impair their efficiency. The best mode of doing this will at once occur to the architect. The patented top of Mr. Kite of London, which he calls the "Diamond Deflecting Top", is constructed on truly philosophical principles.

Where the use of the ventiducts in the ceiling and roof is not approved of, the vitiated air may be withdrawn from the interior of public buildings by means of apertures in the wall, near the

ceiling, communicating with flues in passages made in the interior of the walls. The apertures for the egress of the air should be beneath the eaves, or cornice at the top of walls, and be carefully covered with bars of iron, iron wire, or zinc work, to prevent birds from entering, and building their nests in the flues. The apertures in the interior, for the admission of foul air to these flues, should be masked with ornamental work, and should be provided with valves, similar to those described, for the fresh-air ventiducts, when the entrance aperture is at the top of the wall, as at fig. 19. The apertures for the egress of the foul air may be made to communicate with the space between the ceiling and the roof, and finally withdrawn therefrom, by a ventiduct placed in the turret or spire, if there is one in the building to be ventilated. If there are galleries in the interior, as the foul air from the parts immediately beneath is apt to stagnate beneath them, ventiducts having their apertures in the wall, just beneath the floor, should be made, to draw off the foul air.

These modes of withdrawing the foul air, just mentioned, will not, and cannot, be so effectual in their operation, as the method first described, when the foul air is led off at once, from the highest part of the ceiling, through ventiducts vertically placed. Heated air to be drawn in horizontal or lateral currents, or in any other way, save vertically, requires some controlling force; on the contrary, when withdrawn vertically at once from the place in which it is produced, the fullest advantage is taken of the natural laws which regulate its movement. Heated air should always be confined in the spaces made for its egress, of a size sufficient to contain the requisite quantity, and should never be allowed to spread itself among large spaces, where, cooling, its ascending power is totally destroyed, or at least very materially diminished. These are points very necessary to be recollected, and observed in practice.

In ventilating the apartments of private dwelling houses, care should be taken to give each room an independent supply of fresh air. This may be done by making apertures in the walls, communicating with the space behind the skirting board, which should be pierced full of small holes; or sheets of perforated zinc may be substituted for boards. The architect will at once perceive that the means to be adopted for admitting fresh air to apartments will be various, and greatly dependant upon local circumstances; the principles, however, being in all cases the same. The foul air may be withdrawn by ventiducts made in the walls, communicating with the interior of the apartments by apertures placed behind or above the cornice; or from a central opening in the ceiling, as already described; or one of the chimney ventilators may be used. In ventiducts made in the walls, the apertures for the egress of the foul air may be beneath the eaves, or be led by boxes or pipes to a ventiduct placed at the highest part of the roof.

If the various apartments have free connexion with a central staircase, or corridor surmounted by a skylight, the foul air may be withdrawn from each apartment, by having above each doorway, or at the top of the wall or partition dividing the room from the staircase or corridor, an aperture for the egress of the foul air, which will escape therefrom to the staircase; whence it may be withdrawn by a ventiduct placed at the highest part of the skylight. As the cooling surface of the glass will materially reduce the temperature of the air, the skylight should be made with double glass frames. If the corridors and central staircase in a large dwelling house be well supplied with fresh air, each apartment may draw its supply of air therefrom, through apertures made for the purpose of admitting it; the foul air being withdrawn by any of the means previously described. It is, however, most desirable that each apartment should have an independent source of supply; an advantage too obvious to require elaborate explanations.

The rule for finding the area of foul and fresh air apertures proportioned to the number of people the apartment or building is to contain, is the next point for consideration. The quantity of air required per minute for each individual has been variously

estimated. TREDGOLD makes it four cubic feet; ARNOTT, five; and REID, ten. From an examination of the deductions made by the first in order of these authorities, four cubic feet seem to be amply sufficient for each individual per minute; but the practitioner will of course vary the multiplier, in the following rule deduced by TREDGOLD from his experiments, according to the amount allowed. "The most difficult season for ventilation," says TREDGOLD, "is the summer; and we may consider that there should not be a greater difference in warm weather than ten degrees; and with this limit as to variation of temperature, we shall have the following rule: *Multiply the number of people the room is to contain by four, and divide this product by forty-three times the square root of the height of the tubes in feet; and the quotient is the area of the ventilator tube or tubes in feet.* By the height of the tubes, is to be understood the height from the floor of the room to the place where the air escapes to the atmosphere; and they must be all of the same height, if there are more than one." This point is carefully noted, as otherwise the taller would overpower the shorter tubes. The area of foul air aperture should be distributed over the roof in more than one place: thus if three square feet of aperture were required, instead of making one opening of three square feet in area, it would be better to have three of one square foot each. The size of the aperture for the admission of fresh air may generally be of the same area as that for the egress of the vitiated atmosphere. If tubes are led, say from the apertures in the exterior wall, to the passages in the centre of the building, then they should be of the same area as the foul-air ventiducts; but if mere simple openings are made in the outside walls, then double the area will be required. TREDGOLD (*Principles of Warming*, pp. 76-92) recommends these alterations in size to be made, on account of the fresh air being required in large volume. A tube will accelerate the velocity passed through an aperture, delivering more air in the same time, than will a simple opening; there will, however, be more of a rush with the tubes, than with the large opening.

In these remarks, unnecessary elaboration has been studiously avoided: yet it has been endeavoured to point out clearly the essential requisites for efficient plans of ventilation. In accordance with the arrangements adopted, the various plans generally used are here explained; and if the reader has carefully attended to these explanations, he will have no difficulty in thoroughly ventilating any place, whether the plans may belong to a distinct division, or be dependent for their operation upon a mixture of them all—that is to say, by exclusive fires, machinery, or natural currents, or partly fire-draught, and partly machinery and natural currents.

With reference to the merits of these three modes of ventilating, it is sufficiently obvious that all arrangements depending upon extraneous superintendence and care, must necessarily incur the chance of being neglected. Where a fire is to be maintained, or a machine to be superintended, the chance is that at some period or other they may be overlooked; and when constant and careful attendance is not given, the operation will be varying, inconstant, and consequently defective. Again, the expense of keeping up exclusive fires, or furnaces, or machines, is likewise to be considered; as the power must be kept up so long as ventilation is required, the expense will also be continual. Moreover, the original expense in constructing and fitting up is considerable, and machines require to be kept in good working order.

On the other hand, where advantage is taken of simple unvarying laws of nature, which are always in action, the arrangement dependant upon them will be invariably maintained; and therefore, in all cases, where the nature of the building will admit of it, only natural Ventilation should be adopted.

A writer on this subject, in passing severe strictures on builders, for endeavouring as much as possible to meet the demands of their employers, by tightly closing up every aperture through which air can gain admittance to dwelling-houses,

says: "that luckily, in spite of all their endeavours, their close fitting doors and windows, air still finds access." And so it does: the laws founded for a benevolent purpose will act, however much man may retard and oppose them. Is it not consistent then, with natural laws, to suppose that if air forces itself into apartments, when every means are taken to exclude, and when once in to confine it; that surely it will gain easier admittance when apertures are formed to facilitate its admittance when pure, and, when deteriorated, to allow it likewise to escape? Yet many strenuously advocate the use of machinery more or less complex, in almost all cases where ventilation is required; as if it were an absolute impossibility to supply air without such mechanical appliances.

REID says, that the ascent of air in shafts, at the ceiling, acts in all cases where the density of the air within is less than that of the air without. This opinion is amply corroborated by the result of every opportunity of experience. The cases will be very rare indeed, wherein the conditions above implied will not be found to exist; for in winter, the heated air in the interior is sure to be of less specific gravity than the cold air in the exterior; and even in summer, although the heat of the breath in the interior, and that of the air on the exterior of the building, may be nearer in equality than in colder weather, there is, and must be, a decided difference in favour of that in the interior. This is amply proved, when the fact is considered, that it is much hotter in a crowded building than in the open air, however calm, in a hot summer day; the heat of the bodies, in a certain degree raised in temperature in proportion to the number of people assembled, and the concentration of the heat by confinement, all tend to the result found.

Not only can buildings be ventilated efficiently by the adoption of the laws in constant action, but, what is of considerable importance, the expense of so doing is comparatively trifling; moreover, when once effected, repairs are not required, neither is the expenditure of any expensive power necessary to maintain its operations. Again, there are no complicated arrangements difficult to be understood by that class who, in all public buildings, will generally be found to have their management.

To recapitulate very briefly,—the essential requisites of efficient ventilating arrangements are,—apertures for the admission of fresh air and the egress of the vitiated; (these acting in unison with each other). The fresh air to be always admitted below the zone of respiration, never above; the more the fresh air is diffused, the less palpable will be the currents; the smaller the apertures through which it passes, the better will be the diffusion. Advantage should always be taken of any casual power of fire-draught, taking care to have the air-flues connected with the chimney or furnace, as smooth as possible, and the curves easy. In descending currents there is always a loss of power in using a "gas rarefier", hot-water pipes, or steam jets; therefore, they should be placed at the highest part of the building. Foul air should never be allowed to spread itself in large spaces beneath cold roofs; but in using ventiducts, it should be led off at once to the external atmosphere; the top of the ventiduct being carefully finished at top.

In considering the necessity of incorporating with the original plans arrangements for ventilation, the architect will perceive that the expense will thus be greatly lessened, and the facilities for introducing efficient plans considerably increased. The subject "can never be placed on the most desirable footing, until the principles of ventilation are made a subject of primary, instead of secondary consideration, in all structural arrangements; otherwise, the means of economic ventilation may too often be considered as superseded, before any attention has been bestowed upon them.

"It is no exaggeration to say, that along with those means of defence and seclusion which it naturally presents, the great and primary object of architecture is to afford the power of sustaining an artificial atmosphere, such as the constitution under each variety of local circumstances may require. It is in reality

to every building, what the breath of life is to the human frame—the vivifying principle, without which they would be tenantless and uninhabitable.” (Reid’s *Illustrations*, p. 71.) One very important benefit to be derived from the ventilation of architectural structures will be the admission of fresh air to the beams; this will prove a valuable antidote to the dry rot, by removing that moisture, carbonic acid, and insensible exhalations of animal matter, which form the great food of this disease in non-ventilated apartments.

Ventilation, where at all adopted, has been generally confined to public buildings; nevertheless, while urging with all earnestness the supply of pure air to such places, it should not be forgotten, that the art will not become really useful until it has been applied to the improvement of the dwelling-houses of the vast body of the people. It should be looked upon alike by the professional man and the philanthropist as highly useful for the attainment of benevolent ends, to be used for the benefit of the many, not to be confined to the attainment of comfort for the few. As a remedial measure, ventilation is of the highest importance. What have been long known as “national diseases”, are incontestably proved to be caused almost solely by the effects of impure air. Consumption, scrofula, and a host of minor maladies, if not entirely owing to this cause, are by it wonderfully aggravated in their effects, and rendered more fatal. The deadly typhus owes its malignance to defective ventilation.

No particular building, and no peculiar modification of any system, has been selected for especial consideration herein, as there is unfortunately scarcely any instance to be found, in which the conditions of the case are precisely similar to those likely again to occur to the practical man; nor is there, as yet, a sufficient number of instances of perfect success obtained, by what may be termed, without any invidious meaning, empirical inventions. No one plan or system, however successful in some particular case, can possibly be applied indiscriminately to all; the principles and rationale of ventilation are simple and unvarying; not so the modes of their adaptation: these, in the extensive practice of the professional man, are as numerous as they are varied. It is, then, for those, who wish to effect good ventilation in structural arrangements, to study well the principles, in order

to meet the difficulties which will arise, and so as to carry them into successful operation.

In working out efficient plans, architects have much in their power; indeed, with them rests almost solely the practical adoption of the best systems. It is obvious that good plans are more economical than ineffective arrangements; and, in the case of original buildings with ventilating arrangements primarily incorporated, the expense may be considerably lessened. It is for the architect then, with or without the demand of his client, to propose to adopt arrangements for securing a full and constant supply of fresh air to all edifices, whether public or private, designed for the occasional or permanent use of man.

ROBERT S. BURN.

Of the numerous publications upon this subject, the following works may be particularly mentioned:

History of Warming and Ventilating, by WALTER BERNAN; TREDGOLD’S *Principles of Warming and Ventilating, with Appendix to Ditto*, by J. BRAMAH, 1833; HOOD’S *Warming and Ventilating*, 1844; REID’S *Illustrations of Ventilation*, 1843; ARNOTT’S *Treatise on Ventilation*, 1838; RICHARDSON’S *Treatise on the Warming and Ventilation of Buildings*, Second Edition, 1839; AINGER’S *Ventilation and Warming*, 1835; ALEXANDER’S *Observations on the construction and fitting up of Merging Houses, etc.*, York, 1820; WALKER’S *Useful Hints on Ventilation*, London, 1850; URE on Ventilation, in *Supplement to Dictionary of Arts and Manufacture*; BURN’S *Practical Ventilation*, 1850; *Report on the Sanitary Condition of the Labouring Population in Great Britain*, by EDWIN CHADWICK, 1842; *First Report of the Health of Towns’ Commission on the State of Large Towns and Populous Districts*, 1844; *Second Report on ditto*, 1845; *Sanitary Economy*, W. and R. CHAMBERS, 1850; *Sanitary Movement*, CHAMBERS’ *Papers for the People*; *On the Uses and Abuses of Air*, by DR. JOHN GRISCOM, New York; *Warming and Ventilation* (CHAMBERS’ *Information*, 1841); INMAN’S *Report of the Committee of the House of Commons, on Ventilating, Warming, and the Transmission of Sound*, with notes, 1836.

EXTRACTS FROM THE PRINCIPLES OF WARMING AND VENTILATING PUBLIC BUILDINGS, ETC.

BY THE LATE THOMAS TREDGOLD.

Third Edition. 8vo. London: 1836.

§ 75. If the impure air be to escape in consequence of its own levity and elevated temperature, which in this case will be sufficient, it should be through tubes of uniform diameter, for every enlargement produces eddies, and interrupts the discharge of the air. Each tube should be independent; for if currents be let into the same tube from different apertures, they will cross each other, and interrupt the flow of air. The tubes of rooms on the same level, which communicate with one another, should all be taken to the same height, otherwise cold air will blow down some of them; and if this does not happen, the effect of the lower tubes will be less than that of the others.

An open fire with a chimney in a ward is inadmissible with this mode of ventilation, and will completely stop it; for a cur-

rent of cold air will either come down the ventilating tube, or the room will smoke.

But several tubes from the same level may be opened into one common top with advantage, and this top, whether for single or other tubes, should be either moveable, or the top shewn in Fig. 21 may often be employed with advantage.

The area of tubes should never be greater than is wanted for the extreme quantity of ventilation; for a tube that is larger than necessary, will either allow a double current, or the rising current will be retarded by eddies.

§ 138. Ventilation is most difficult to maintain in close, still, gloomy weather. Suppose we wish to provide ventilation sufficient to prevent the internal air from being of a higher temper-

ature than 5° above that of the external air; now if the external air be at 70° , we shall not be able to keep the internal temperature down to 75° with a less escape of air than two and a half cubic feet per minute for each person, because each person will heat quite that quantity of air 5° in a minute at these temperatures.

When a church contains one thousand persons, and the height from the floor to the top of the tube is forty-nine feet, we have to find the sum of the upper apertures, that will allow two thousand five hundred cubic feet of air per minute to escape when the excess of temperature is 5° , which is easily calculated by the rule in the note to Art. 64. That is $\frac{2500}{30\sqrt{49}}=12$ square feet. If the height be only 36 feet, then $\frac{2500}{30\sqrt{36}}=14$ square feet nearly. When the ceiling is level, this area should be divided among five or more ventilators, disposed in different parts of the ceiling; but in a vaulted, or arched roof, perhaps three will be better, placed in the highest part of the ceiling.

§ 140. In applying heat to theatres, and places of a like nature, steam will always be found most safe and economical. The proper ventilation is of considerable importance, and may be easily effected on the same principles as have been explained for churches. But it may be useful to remark, that Mr. GEORGE SAUNDERS, who studied every means to avoid the loss of sound, says, "the apertures necessary for changing the air, should have covers to fit close, and be opened only between the acts" (*Treatise on Theatres*, p. 32, 1790); considering, and very justly, that much motion in the central parts of a theatre would increase the difficulty of hearing. To avoid this difficulty, the air which collects in the upper part of the boxes might be easily conveyed by separate tubes to the upper part of the house, and escape by the ventilators at the top. This mode would reduce the motion of the air in the central parts of the house; and, consequently, render continued ventilation less objectionable, besides giving the advantage of good ventilation at the back part of the boxes where it is most required. The same writer remarks, that the apertures for admitting fresh air should be general, that is, distributed over every part of the house, to prevent the occurrence of draughts of cold air; a plan which perfectly coincides with my own ideas on the subject: and in the winter season it would be desirable to warm the fresh air as it is admitted. In summer we should be able to keep the temperature down to within 5° of the external air in sultry weather, and suppose the air to be at 70° , then, an area for two and a half cubic feet per minute to pass through, should be allowed for each auditor; and as the height of a theatre is from forty to fifty feet, from the pit to the

ceiling, and there is at least the height of the roof in addition, we may take sixty-four feet for the height of the column of rarefied air: and by Art. 64 we have $\frac{25}{30\sqrt{64}}=1$ of a square foot for each auditor. That is in a theatre for two thousand people, there should be $\frac{2000}{20}=21$ square feet of ventilators. Considering the motley character of the audience of a public theatre, I have no doubt that some of my readers will think I have allowed less than is desirable: in answer, I say, the stay in a place of this kind is short; it is in the rooms we most frequently inhabit where ventilation is most necessary.

§ 178. The ventilation of a room warmed by an open fire is defective, because the air, which has been rendered impure by respiration, etc., cannot be removed by the chimney as it is usually constructed. It has been proposed to remedy this defect of our dwelling rooms by various means; but all that I have seen, or read of, are objectionable, either from being wholly inefficient, or from causing the chimney to smoke. Mechanical processes are troublesome, and hence are neglected; otherwise the object might be easily enough managed. To employ the heat of any other fire than that which warms the room which it is proposed to ventilate, would be to render two fires necessary instead of one; and, perhaps, after all not obtain the desired effect. I shall propose one remedy, which I have little doubt will be in a great measure effective.

If an inverted syphon be placed with one leg in the chimney, so near to the fire that the air in that leg will become warmer than the air in the other leg, motion will take place; for the air will ascend in the warm leg and go up the chimney, and a descending current in the cool leg will take the air from the room.

To render the application of this principle successful, the mouth of the tube should be at the ceiling of the apartment; the lowest part of the curve should be, as much as convenient, below the point where the heat is applied; and the aperture, through which the air flows into the chimney, should be formed so that the soot may not fall down the tube: also the mouth of the tube should have a register to close, or to regulate the ventilation. Such a tube may be easily placed in an angle of the chimney-breast, or let into the wall. The branch, or leg which goes up the chimney, should be brought so near to the fuel in the grate as to receive a considerable portion of heat. * * * * When, by means of steam, the room is supplied with warm air, a method of ventilation of this kind will be most effective, and most necessary; and in a large room there will always be more heat required than an open fire can supply, so as to render the room comfortable to more than those immediately round the fire.

THE PRINCIPLES AND PRACTICE OF ARCHITECTURAL DESIGN.

ONE of the fundamental principles in architectural design is perfect adaptation to the purpose intended. It is this purpose which originates the building; and it is only by a strict and uncompromising regard to the full provision, and to the perfect adjustment, of the various conveniences required, that an architect can be said to put himself under that self control and discipline, which are necessary to insure a satisfactory result to his subsequent operations in the more artistic features of his design. Superficial display is a dangerous attraction for the artist; and he should, therefore, the more scrupulously respect those considerations which conduce to substantial reality.

The connexion of the constructive, with the exhibitory, features of a fine building is not less intimate than that, which exists between the mechanical perfection of the skeleton and the "form divine", of the complete man. The imperative laws of practical truth must chasten and inform the lively impulses of poetic fancy; for the separation of the "utile" from the "dulce", by regarding them as wholly distinct in their nature, is a vulgar and pernicious fallacy.

Where truth exists, the poetical enunciation of it involves additional truth; and where a perfect adaptation to purposes of utility is found, grace of superadded ornament is the more useful. Thus the sole consideration of this fundamental principle, without any reference whatever to decorative application, will go far to create the beauty which constitutes a building a piece of art. Since a design, in which the component parts are rendered duly subordinate and conducive to the best interests of the whole, will exhibit a necessarily induced form and a serial proportion, satisfactory to the eye of intelligence, though the ornate features be not yet applied, nor the exact appropriation of the structure positively declared. In short, the designer may rest assured that a building, honestly and thoroughly considered in respect to its plans and sections, will suggest those elements of expressive decoration, which, consistently cultivated, cannot fail to produce elevations of dignity and beauty.

In illustration of the inseparable connexion between the "utile" and the "dulce", it will be observed, that the mention of this fundamental principle gives rise, as it were spontaneously, to the anticipation of the other, which is secondary only in the order of succession. It must not, for a moment, be supposed, that the artistic properties of architectural design are inferior in importance; it is merely urged, that the utilitarian portion of the architect's labour should be thoroughly and independently worked out in the first place,—that the skeleton and substantial body should be framed and formed before features, which give grace and expression, are at all considered. Knowing that the artistic process is to come, or rather that it waits his coming, the architect must not anticipate what bides its time in patient dignity. The thought of it must not disturb—much less distract—the strictly regular progress of his work;

he must act as if the operation might be arrested at the consummating point of mere practical utility. The builder-architect has to yield into the hands of the artist-architect a simple model, perfect in its general form, arrangement, and construction. In other words, the same mind has to exert all its best powers of practical ingenuity and science, before it gives the rein to imagination and taste.

The other fundamental principle of architectural design is perfect adaptation of decorative features to the carcase, of which they form the superficial grace, and to which they are simply intended to give artistic expression. These features are in no respect to be applied to the building, as things having a distinct and separate existence; but they are to be confined to such a display as may be suggested by the character and formation of the building; a superinduced result, owing to the parentage or willing adoption of the substance on which they are to be formed. The matter of the argument is already produced; its logical arrangement is decided on; its general conclusions are formed; it is substantially perfect as a piece of reasoning; and wants only the graces of art.

The process, involved in the secondary principle, is to invest the subject with beauty of diction, with poetic illustration, and with the charms of rhetoric. As in the first instance, the artist was true to necessity; so in the second, he must be true to permission. The construction of the machine is complete in respect to its bones, its sinews, its covering, and general form; there is now a sufficient latitude allowed to the imagination, in giving to it a suitable complexion, and in gracing its essential and varied parts with features of ornate and distinctive character. What the skin is to the body, the hair to the head, the eye-brows and lashes to the eyes, and the lips to the mouth,—such is the marble casing to the walls, the cornice to the façade, the pediment and architrave to the windows, and the porch to the door. Nor is the architect wholly restricted to such appliances; as the painter and the sculptor are at liberty to employ such accessories as advance the significance or dignity of their productions, so the architect may make use, to a certain amount, of features, not essential to the perfection of his building critically considered, but still admissible as suggesting some sentiment connected with its individual peculiarities. Thus the sacred temple, perfect in its fitness and in the architectural expression of its solemn purpose, may yet, without detriment to this critical excellence, be characterised by an extrinsic splendour, having reference to the sacrificial devotion of an offering to the Deity. The palace, complete in its convenience, arrangement, and consequent architectural presentment, may yet exhibit increased gorgeousness, typical of the pomp which waits on regal state. The city-hall, a model of its kind as a piece of sterling architecture, may yet be rendered of more interest by such additions as call to mind municipal importance, festive bounty, and commercial wealth.

Indeed all buildings, of whatever kind and degree, are, in addition to their merits, as finished pieces of architecture, susceptible of certain congruent and expressive graces, as works of art in the more general sense of the term. The sculptor and the carver of ornate symbolism may be called in, even at the end of the eleventh hour, to carry out the ultra-final conceptions of the architect in the further "illumination" of his work. But it must be observed, that this is a most delicate operation, to be ventured upon only by those who have arrived at this perfection by the most scrupulous gradations of experience. It is the last to be thought of, as well as the last to be done: it rests upon an hundred foregone and successive permissions; and is the ultimate privilege of an imagination, so self-castigated from the first, that an habitual preventive of excess has been thoroughly insured.

According to the value, of these two principles, it will appear that the primary consideration governing the architect will be the exercise of that sagacity, which, in some degree at least, is common to all men; and which, when exercised in this particular calling, will enable him, without regard to any known style of architecture, or any conventional forms, to arrange his walls, partitions, coverings, and openings, in the manner most conducive to the required capacity, convenience, shelter, light, ingress, and egress. Nothing that he now does should have reference to any particular anticipation; for to start with yearning thoughts of a portico, dome, or mediæval model, for every subject, is to stumble at the threshold. The only promise, to which he may now bind himself, is to do the best he can for the purpose placed under his care. He may, hereafter, go to the past for classic, gothic, or other ancient details or features; but he is now to think only of walls, with openings in them for doors and windows; posts and beams, or piers and arches; vaults of brick, or roofs of wood; such decidedly essential parts, in short, as constitute what may be termed the aboriginal forms and combinations,—the materials of legitimate design.

The best arrangement of plan will first demand his most serious attention; and this will give a fixed ground-outline, from which to raise the vertical planes of the elevation. The necessities of construction will then equally demand his care; and these will induce certain sectional forms, varying with the material which circumstances may render more or less absolute. Plan, section, and elevation, will be subsequently modified into that equality of concession, which may leave the general body of the structure as perfect as man's imperfect ability may hope to make it.

The secondary consideration governing the architect, and one which is more peculiar to himself, will be the adoption or modification of some style of architectural decoration, or the employment of some new (and more appropriate) manner of ornamenting the surface of his edifice. He will now bring into operation,—not a servile obedience to limited attainment and partial precedent, but—a free exercise of that adaptive and inventive intelligence, which results from the unrestricted cultivation of general knowledge and of an universal acquaintance with varied examples. He has not been, hitherto, working up his rough model to receive any prescribed manner of architectural finish; but, on the contrary, he has bound himself to such a "finish," as the independent requirements of his rough model shall demand. The yet unadorned structure is to be honoured as the parent of the future ornate piece of architecture; and, if the latter strictly and truthfully reveal the character of its original, its durability will be insured, and its worth will be acknowledged by posterity. It is possible that the architect may be thrown wholly on his inventive resources, in which case he will make no further use of precedent than the Greek architect did of Egyptian Thebes; i.e., he will improve on certain sentiments of declaratory power or expressive beauty, as shewn in the olden appreciation of majestic simplicity or suitable decoration,—but he will seek in his own disciplined imagination for those details of ornate expression which are to produce parallel—but not similar—effects.

The architect's early studies, therefore, are intended for the education of his mind, and not for the dogmatic guidance of his practice; and the more extended those studies,—the more general his intimacy with Egyptian, Greek, Italian, Byzantine, Arab, and Mediæval art, the less will he acquire a prejudiced partiality for any particular variety. He will study rather the principles which are common to them all, than the forms and features which are peculiar to any one of them singly; and he will find that the true spirit of imitation may be more devotedly shown, in emulating the independent and inventive genius of those, who have distinguished themselves in separate styles, than by the practice of a bigoted system of copyism. At the same time, while his invention is stimulated, he will necessarily imbibe the virtue of a modest deference, arising from that reverence, which he cannot but acquire in his "worship of the great of old".

Matured in themselves, as may be the great specimens of art, which illustrate the successive epochs from the date of Thebes to that of York Minster, there may still be requirements, demanding forms and features which are imperfectly, or not at all, supplied by existing or recorded examples; and the dictum, which imperatively prescribes that any desired new building shall be in the certain style of a bygone period, is simply one which demands the production of an academical "exercise", a mere school theme, for which even dulness may "cram" itself, and which will leave laborious book-knowledge to triumph over inventive genius. The amateur advertiser, if he mean more than such an exercise, has assumed to himself, in the first instance, a right of selection for which he is unqualified; and he has promised himself, in the second place, the exercise of a judgment which he is not competent to form. He cannot know so much, without knowing more; and it were better that he should consult the interests of art, by himself doing that, which he has too condescendingly invited the architect to do for him. He may be (if an intelligent, an accomplished, and unprejudiced man) competent to judge between two designs made by two wholly unfettered architects; but, if he has begun by prescribing a favourite style of his own, he can only end by deciding in favour of that which approximates to his own peculiar notions; assuming, in short, the questionable privilege of judging in his own personal cause.

One of the most absurd of prevalent fallacies, is the right asserted by all parties of pronouncing on matters of taste: as if matters of taste were matters of superficial whim, idiosyncrasies of a constitutional fancy, having reference to things of an entirely separate and individual existence, apart from those matters of substance on which they are to be exercised, and from which alone they derive their vitality as matters of worth. He, who has designed and constructed the building, ought to be the best judge of those more superficial appliances which come within the province of taste; since there can be no good architectural taste which is not expressive of, or suitable to, the feelings and purpose, which have governed the designer in the general form and construction of his model.

A piece of architecture, though it be private property, is yet a public object. No other works of art proclaim themselves so openly to the world; and it is the duty, even of the most free-born Englishman, to eschew the ostentatious exhibition of a mere personal manifesto. If freedom be, as Hartley Coleridge says, "a universal license to be good", the sentiment applies not less to correctness of taste than to propriety of morals. He, who rears an imposing façade, which challenges, and may continue, perhaps for ages, to challenge the admiration of passing thousands, has ventured on a responsibility which concerns the cause of universal license,—i.e., of such license as may be universal, consistently with the sovereign laws of truth.

When architects shall again be architects indeed,—i.e., professors and practisers of certain universally admitted principles, they will teach their critics to estimate that beauty only which is the exponent of truth: but so long as architects shall condescend to

waive their authority as teachers, and to yield, for the sake of pecuniary patronage, to the caprices of individuals, or to the partially informed opinions of incorporated amateurs, they can establish no principles, and impart no catholicity of feeling. They must remain the mere draughtsmen of prejudiced employers, with no hope beyond that of temporary emolument, with no prospect of imperishable fame.

The nation, that would leave monuments to address the sagacity, and claim the homage, of remote posterity, must be unanimous in opinion, at least on national principles, as well as obedient to national requirements. The recognition of these principles and requirements will be, of course, common to the public and to the professor; but the manner of treatment must be left to the professor exclusively. The only combination, which can lead to the desired result of a national architecture, must be that of the associated public,—pronouncing a clear distinct demand for a certain thing of simple and defined purpose,—with the entire professional body, prepared by reflection to answer such demand in the best and most uniform manner. While particular architects are attached to particular bodies of employers, nothing but the unfruitful results of sectarian art can be expected. People chiefly differ when there is nothing very important to agree upon; and they will continue to disagree, so long as the fashion of the thing is determined previous to a decision as to the thing itself. Egyptian, Greek, Byzantine, or Gothic art is great, because all the examples of each are obedient to a supreme national rule. The architects of each variety brought their differing, justly-constituted minds to bear upon the same object; and produced, not repetition, but resemblance; while they still maintained that characteristic individuality, which is to be found in every example of the human form. Man resembles man throughout the world; but no two men were ever yet found exactly alike.

To illustrate the practice of these two principles of architectural design, a particular case may be selected, viz., such as that of a religious edifice, adapted to the ritual of the Church of England, assumed to be built of stone, and covered with a vaulted ceiling; with walls enclosing a space sufficient to accommodate not less than one thousand persons seated, all of whom may distinctly hear and see the officiating minister. A tower is required for the bells, as well as to denote conspicuously the position of the church, whether in the town or in the village. The building must include suitable porches, a spacious entrance, a baptistery, a recess for the communion table, and attached vestry and other needful rooms. No galleries, except an organ-loft, are to be introduced; nor any wood-work, except the internal fittings, the roofs over the vaultings, and the upper floors of the tower. It must be, in every respect, a handsome, consistent, and durable piece of architecture, worthy of its sacred purpose, and aiming at perpetuity. The amount of decoration must be such as circumstances, and the nature of the design, may require; but the building will, of course, derive all its essential beauty and grandeur from the attention bestowed on the general arrangement of its parts, and the nice adjustment of their relative proportions. No pseudo-architecture is to be admitted; nor any ornament but that which may be suitable to positive features, or such symbolical accessories as may give additional expression and richness, without injury to the simplicity and general effect of the mass. There must be no deceptive concealment of required means, nor affectation of necessity, to give a false warrant to imposing objects in the composition.

It will not be necessary to detail the process, with every successive step of reasoning and every modification of thought, by which an architect of independent mind will gradually advance, and ultimately arrive at his conclusively adopted model. To do this would require a book instead of a mere essay, and in place of the few subjoined illustrations, a portfolio of drawings and studied sketches would be necessary. The comments and reflections, which follow, must be regarded as mere starting points in the reasoning process, and the figures must only be viewed as

ARCH. PCB. SOC.

types of ideas in illustration of the argument: but they will suffice to shew the mode in which an architect should experimentalize in composing a design, which may equally evince a regard for his own independence, and his respect for the precedents of antiquity.

It is presumed that, whatever be the form of the auditorium in each variety, the other parts of the building will remain generally the same cubes throughout.

The circular, or polygonal form of auditorium, Fig. 1, will be first considered; containing in its area space for a thousand sittings, which can be well and conveniently arranged, both for sight and hearing. There will unquestionably be much grandeur in the effect of such a rotunda, surmounted, as it must be, by a single vault. Hitherto somewhat of a classic dress has always been adopted for such a cubical mass. The dome within and without will exhibit that expression of majesty, which is displayed by the Pantheon, and there will be nothing displeasing in the general form of the plan. When the sectional construction and internal proportion have been decided, there results the general external form, which honestly and truthfully deduced may or may not be admitted, to have something that is highly picturesque in the clustering of the parts; but it may also be urged, that the parts are too distinct in their individuality; that it is a combination of separate forms attached to one another, instead of a single form composed of parts contributive to uncomplicated effect; that the high square tower, and the low spherical dome are in rivalry; and that the vertical elongation

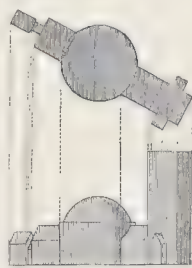


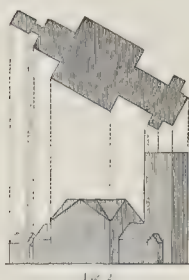
Fig. 1

is in contest with horizontal expanse; which is the principal characteristic of the building? If it be said, "raise the dome to a more suitable external proportion," that cannot be done, since the internal proportion will not allow of increased height: besides, the dome has primary reference to internal effect, and the tower is required by the very term of the instructions to be the external conspicuous object. The sentiment of firmamental expanse is desired within; and additional height will be equivalent to diminished horizontal space. Again, the junction on the plan, of the square with the circle must involve an imperfection; a segment of the latter must either be cut off, or it must be permitted intrusively to its attached squares. A remedy is obtained by adopting the octagonal form. Still the wide swelling dome will, in its close neighbourhood to the tower, look like a crouching giant by the side of an erect one; thus there are two giants; one only is required, and even that should not be the tower or the dome, but the entire building. The vertical altitude of a tower, balanced by the horizontal length of the attached body of a church, may exhibit a distinction without a difference; elongation is common to both, and unites both into one whole: but there exists vertical continuity and horizontal interruption; the glassy surface of the waterfall descends to be shattered among the breakers below; or to reverse the action, and vary the simile, the spectator is ever endeavouring to escape from the turmoil below by ascending the rock which rises from it.

In plain language, the main body of the structure is here under such different conditions from the rest, that no continuity of feeling can be preserved. It is, at least, a question whether any skill (consistent with perfect architectural integrity) could prevent the appearance of complication, where unity is the great desideratum. A form must be found, which shall comprise internal advantages, of convenience and beauty, equal to those of the circle or octagon, with a corresponding amount of external propriety.

The perfect square Fig. 2, may be taken next as the outline of the required auditorium. Its capacity is, of course, made equal

to that of the circle or octagon; but instead of the dome springing from a polygonal or circular tambour, its quadrangular area is to be covered with a vault; and in lieu of a continuous abutment, dispersed equally through the uniform substance of the supporting inclosure, the pressure of the vault must now be concentrated on four distinct abutments, one at each angle of the square. The internal result of this disposition is susceptible of being rendered impressive. The exterior of the main body, if



in the Classic or Italian styles, may present four great gables or pediments: but it becomes too box-like; though it will perhaps be admitted that the effect of the whole is more harmonious than in the first example, and that there is a breadth in the contrasting light and shade which tells powerfully. Still the auditorium is too massive in its bulk, and too overwhelming in its relation to the tower, as well as too crushing in respect to its minor adjuncts; the whole presents too decidedly a cluster of distinct portions, abutting each

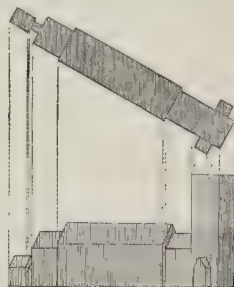
against another. What it gains, externally, over the former model, it loses internally; and we may perhaps regard the result of the contest between them as undecided. The next suggested form for the main body of the edifice, is that of the rectangled parallelogram of the Romanesque period, Fig. 3; to be covered with a continuous "waggon-headed" vault, or with a series of groined vaultings. If the former exceed a certain length it will appear tunnel-like. If the latter be employed there must be, at least, three bays or openings, for a pier is never admissible where it is obviously central. Whichever may be taken, a length equal to three bays will be the best for an interior, which is to retain the proportions, of a compromise between length and breadth, i. e. of a room as distinct from a gallery.

In following out, from the required area, the regular process of the resultant section and elevation, a cubical mass is obtained, not so distinguished by breadth of shadow as the last attempt, but, critically considered, of a better general form; leaving the tower the supreme external feature, as it should be, so far as it may, consistently with its being only a part of a harmonious whole. If the waggon-headed vault be employed, the side walls must, of course, be thick; but if groined vaulting be adopted, the projecting external buttress is the consequence; and the assistant pier may project within the building, so far as it can be allowed without detriment to sight and hearing. But the employment of these vertical features so corrects the horizontal length of the main body of the structure, that its extension is immediately suggested; and the employment of the buttress and pier, (which may be chosen to afford increased opportunity for perspective effect) having been decided on, it is clear that, to a certain extent, the proportions of a gallery may be taken for the auditorium, a truth which the Gothic architects clearly perceived and established.

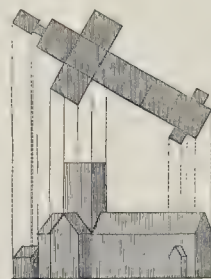
The parallelogram is next, therefore, narrowed and elongated, so as to include the required area within its walls as before, Fig. 4. It is now obviously improved by the diminished span of the vaulting; but there is (or the artist has learned to consider there is) a certain required proportion between the width and the height of a semicircular vault or arch, which is now interfered with. The pier looks too high; the crowning cylindrical vault springs from stilts; it becomes so fore-shortened that it seems flat; but though

width is resigned, height cannot be forfeited and it is therefore desirable to lower the springing of the arches. The long and narrow half of an ellipsis may be tried; it is not pleasing; it expresses a checked aspiration.

The pointed arch is satisfactory, as it expresses infinite ascent; for a perspective of parallels may be so elongated as to present in appearance a distant point. Length and height have now become the theme, as opposed to expanse: the rich perspective fascinates: still such a continuous length of sameness must be regretted; and when the building is viewed externally, on looking more directly against its elongated side, it lacks the picturesqueness of varied mass; there are too many strips of shadow; breadth of shadow is required, which the tower alone exhibits in the aspect chosen, while more planes of dark are wanted to contrast with planes of light. The building also is still, in a measure, a range of distinct blocks. The tower is with the rest, rather than of the rest.



The width of the main body of the building is next reduced, so as to make the ridge of the roof and the range of the parapet continuous with those of the baptistery and of the recess for the communion table: but of course, if the last plan be preserved, the evil of disunion is only corrected by increasing the above mentioned defect, "the continuous length of sameness". This brings on a most important change of form; a change which no precedent was required to suggest, but which, happily, precedent is ready to justify. The idea of the cruciform plan, Fig. 5, is, at length deduced. It is found to be suited pre-eminently to the purposes required; a large superficies for sittings is obtained, without great width between the walls, and without too great length from the position of the minister to that of the most distant auditor. Practical convenience is associated with symbolic form. In the former plan a length of eight bays was taken: on that now under consideration, two of these bays are taken from the length, one given to each arm of the cross, to make the transeptal length



across the front of the chancel, or recess. The sides of the church have now their gables, as well as the ends; a noble projecting mass gives character, expression, and picturesque boldness to each side of the building; for now there are three distinct (but perfectly united) features in the nave, the transept, and the chancel; while the whole body to a certain extent is decidedly one. But, to improve still further and to render the building more comprehensive in unity, the crowning triumph yet remains. The tower needs no longer be a thing attached; it becomes the cognate member of an undivided whole, springing as legitimately from the square of intersection, as a truthful deduction does from philosophical reasoning on admitted premises. Thus a form is obtained which, so far at least as regards its general shape and mass, is manifestly superior to all the others.

The architectural style, which each form suggests or best admits, may now be considered with all possible fairness. The arch and dome are Roman; novelty needs not to be sought for novelty's sake; antiquity, in fully meeting its own wants, anticipated many of ours; and it has left us the cornice, impost, archivolt, column, entablature, and pediment; these are as ap-

propriate to our first model (the circular), as they were to the Roman Pantheon: while the campanili of Italy fulfilled the uses of the Gothic bell-towers. Old forms may be modified, and old details with their application, may be improved; but in a general way they are to be accepted with gratitude and faithfully introduced.

The second, or square form, is equally subject to Italian treatment, though the plan admits of some features which perhaps belong more to the eastern and mediæval, than to the ancient Roman periods. The details of the Palladian, and still more of the modern schools, afford us much that harmonizes with our notions of the antique, and perfectly suits modern requirements.

As the circular vault and arch remain in the third form, that of the parallelogram, the artist is confined to choose his decorative details from the Roman, the Romanesque, or some modification of those styles. The great proportional width continues to enforce the low pediment or gable; buttresses and vertical pressure are required to resist lateral pressure; but buttresses may be Romanized, or, rather, Anglo-Romanized, while the balustrade, with its pedestals, figures, and ornamental vases, may be made to serve the purpose of Gothic buttresses, parapets, and finials.

Rejecting the Romanesque,—not less in its Anglo-Norman, than in its Italian and German form,—and despairing of any original style within modern powers of invention, the architect will recur at once to the pointed arch, as it induces less proportional width, while it occasions higher gables. For decorative details there is abundant precedent in the various mediæval Gothic styles; but it would be ridiculous to refuse the adoption of some variety of that pointed architecture which was brought to such perfection of detail in our English cathedrals. The architect, therefore, can adopt the high pointed, with its simple windows; the pillared and foiled windows of the second variety; the mullioned windows, with the tracery of the third; or the mullioned and transomed work of the fourth period: at all events, he would use a Gothic style in all the decorative features. Having obtained his general model, and deduced the leading forms and members from considerations, wholly independent of bookish theory, and solely referring to the strict purpose and modern character of the building, he may now (creditably to his modesty, and without compromising his inventive freedom), go to a Glossary of Church Architecture, and be as particular in the selected examples of detail, as the most devoted of Diocesan Societies could desire. The most strict observance of the details presented by English ecclesiastical monuments, will still leave his modern church to stand on its own merits as an original. Internal detached arcades, flying buttresses, clerestory and triforium, are utterly discarded; and instead of the triple combination of nave and aisles with two ranges of windows, there is now one lofty single nave, lighted by a single range of windows. Such a design, it cannot be denied, simple and plain though it may be, will present a more decided character of unity than either of the three preceding combinations.

But the union is not perfect; it is still a conjunction of separable cubes, far inferior in effect to the Gothic decoration of the model last to be considered, namely, the cruciform. Here the architect can lessen the projection of the buttresses by reducing the width of the vaulting; and can reduce them further, by adopting the vertical weight of the pinnacle. The use of the latter at once suggests (because it justifies) the adoption of the spire. If the pointed style be carried out, he has the idea of a Gothic church, for modern use; perfect in its unity; challenging further advance; from which nothing essential can be taken; to which nothing essential can be added; the sides of which have a nobler elevation than the church with aisles can ever have; the steeple of which emerges, as if naturally, from its cruciform substructure, the whole majestically rising pyramidically from the expanded and varied outline of its base, at once simple, ornate, and expressive of its holy purposes.

ARCH. PUB. SOC.

It has thus been attempted to explain the operations of the two great principles which should guide the architect, in forming and maturing his design for any building, whatever its use, or whatever style it may induce; and a case in illustration has been given, in which the adoption of the Gothic style has been finally resolved on, from the conviction that it is the most applicable to a modern church of large dimensions, although the latter necessarily differs in some important particulars from the Mediæval model. But the adoption in this one instance is by no means to be construed as advocating the idea of Gothic architecture being suitable to every description of building. On the contrary, it is rather believed that a like application of the same principles, to almost any other purposed design, would lead to an almost absolute rejection of the Gothic style, and to the imperative adoption (subject, of course, to many modifications) of the revived Græco-Roman architecture. The present rage for the numerous quaint Mediæval varieties to be found throughout Europe, is a sign that the true Gothic mania is declining. Already is the feeling for the fine old English architecture giving way to a wild reveling among foreign examples of transitional periods, and the country is positively becoming a mere museum of miscellaneous specimens. Things interesting as illustrations of the past (to be respected in their venerable existence, and worthy of regard in their pictured representation), are seized upon with unthinking avidity, and practically exhibited in brick and stone, as the works of the draughtsman successively issue from the publisher. What should remain in books, rises in form palpable to feeling as to sight. What should only operate to the establishment of "principles", stimulates to activity in the idealless work of unprincipled imitation. Instead of the results of general information, each architect gives a servile example of his partial knowledge, leaving the public to revel in a licentious multiplicity of bewildering varieties. Just as the conflicts between the ancient systems of philosophy produced no truly philosophical result, so the modern clash of architectural fancies brings forth no architectural truth. Some architectural Bacon is required to supply us with a "Novum Organum", which may teach us, from observation of the past, to deduce wisdom for the present.

An endeavour has been made, in the foregoing observations, to indicate at least such a process of thought, experiment, and deduction, as might, if universally followed, give rise to a system of national architecture; an architecture of several varieties, which would still be pleasingly and expressively associative. But where shall we now find any orderly association or expressive individuality? Instead of the combination of different objects, each marked by its own peculiar features, we see buildings in which purpose is belied and degree confounded. Many churches are only known by their steeples; the palace front is rivalled by the shopkeeper's façade; the manorial residence of the olden style is surpassed in effect by the poor-house; the railway-office may be mistaken for a collegiate institution; infantine ignorance approaches its first teacher under a classic portico, and crime is incarcerated in a baronial castle; liquor is purchased amid Corinthian splendours, and tobacco is retailed, and almost every trade is carried on, in a cabinet gorgeously decorated à la Louis Quinze. Assuredly there is a specialty of rule for each kind and class of building, and an expression of degree suitable to every building individually. By the process followed in determining the form and style best adapted to a church, a canonical decision may be adopted in regard to every other structure.

Of one kind,—to differ only in superficial expression and relative degree,—are the state palaces of royalty; those of the nobility; the senate-house and all other government edifices; all public structures, forensic, civil, and municipal; buildings devoted to the fine arts and polite literature; theatres and other structures appropriated to refined entertainment; club-houses and buildings intended for the social union of the highly educated and wealthy; the mansions of the aristocracy; the residences of the hereditary, the professional, or the merchant

gentry. All these being, more or less, susceptible of imposing scale and ornate stateliness, are enumerated under one class; and for each variety above enumerated, without an exception, mature consideration leads to the assertion, that Græco-Roman forms and details (modified by the Venetian and the recently influential British schools) preeminently claim adoption.

Of the next kind of buildings, are to be reckoned those which, from their nature, are more confined to a simple purpose and a marked expression of necessity. Such are asylums and edifices devoted to charitable purposes; institutes for the educational benefit of the million; gaols, and structures of penal intent; manufactories, warehouses, shops, and all buildings dedicated to the practical operations of commerce, or appropriated as offices or suits of business-chambers. In these the Græco-Roman style would still be considered the one to be employed; but with such a scrupulous rejection of the elaborate and refined delicacies which were admitted in the former case, that a marked distinction should be unmistakeably emphasized. Nothing of a prominently ornate character is admissible, except where it is obviously expressive of the main purpose of the building. Perhaps a more suitable example cannot be found to illustrate this position than the prison of Newgate; with a somewhat heavier cornice it would be a perfect piece of expressive architecture; nothing Gothic ever exhibited the substantial and hopeless gloom of its square and windowless rusticated masses. The niches near the angles relieve the superficies without penetrating the mystery, and the house of the gaoler just shows that he is himself no prisoner; but the manacles of the gaol porches are intimations that he who becomes a prisoner may expect to remain one.

The third class of structures is wholly connected with the education of those, whose learning and acquirements are to fit them for the important position they may be called on to occupy in the Church, the Senate, on the Bench, at the Bar, or in their magisterial and professional callings; and within this class may be included such official houses and buildings as are closely connected with the Church. If all education should be founded on a religious basis, the future lawyer and doctor of medicine should, for the time, be Christian learners in common with the intended divine. Therefore, as it has been decided that the church should be Gothic, the writer would assert that our colleges shall be Gothic also; or, at least, designed in that modification of the style which, during the reign of the Tudor dynasty, was adopted for the general purposes of building. The parsonage-house and the church-school building should be Gothic, for the sake of harmonizing with the church; and should not even the private chapel, though attached to an Anglo-Venetian palace, be Gothic also?

But in a general sense, excluding the exceptions just allowed, it is maintained that every modification of the Gothic style is utterly unsuited to civil and social buildings. Such buildings, when executed in this "fashion", may be picturesque, but they are essentially inelegant; and the most admired effects are produced by the forced application of features, unnecessary, and often opposed, to comfort and convenience. During the former prevalence of the domestic Gothic style, cleanliness was impossible, comfort seems to have been unknown, and convenience despised; the floor was strewn with rushes, and the wind found a ready admittance through the crannies between the iron casements and the stone mullions. We are now accustomed to carpets which may not be saturated with damps; and we are susceptible of taking cold, which may not be risked by ill-fitting windows. Every architect knows the expedients and contrivances, which are

necessary to make Tudor forms compatible with modern feelings; by using internal wood-work to patch up external stone work, and by making lifting sashes look like hinged casements. Gothic architecture, in its severer sense, is only applicable to the church, or to buildings of but one story. Its natural and proper covering is a vault. The pointed arch, perhaps, grew out of the circumstances attendant on groined vaulting; and our reasonings may have shewn that it might have been so produced; but, at all events, true Gothic pointed architecture is constitutionally opposed to a successive series of horizontal floors; and, to sum up the argument in few words, the Tudor square-headed window with the flattened arch, as applied to domestic architecture, is nothing more or less than the transitional step from the pointed Gothic, which was unsuitable, to the horizontal Italian, which was found in every way convenient.

The fourth class of buildings which demands distinct consideration, is that which, in a constructive point of view, comes more directly under the management of the engineer, and in which an imposing simplicity is the great desideratum. London Bridge is admitted to be a signal instance of success in this respect: but what are we to say to the multifarious bizzarries of the railway buildings? Was there, in erecting the various stations and termini, no peculiarly suitable dignity or beauty to be deduced from the forms and necessary construction of a vast shed, with adjoining rooms for busy clerks and hungry travellers? Is not the Halle aux Blés, at Paris, a far better sample of what may be done with Roman, than the Bristol station of what may be accomplished with Gothic, forms?

To the fifth class belong the country residences of the gentry: and what can be more beautiful as an object, or more favourable to a picturesque irregularity of plan and elevation, than the Italian villa, with its cantilevered roof and its lofty Belvedere, its bay and balconied windows, balustraded terraces, and classic accessories of vase and statue? It has all the advantages of the clustered Tudor House, with others peculiar to itself, and of the paramount recommendation of an especial adaptability to our climate. The Tudor and Elizabethan houses derive additional effect, from being built in wooded hollows: but now, no man of sense builds in such situations. The Italian villa is improved by being placed on a wooded acclivity, where every one now desires to build. The choice lies between the sombre quaintness of the former and the cheerful elegance of the latter; and there is no question that, if a wandering stranger should be suddenly confronted by both, he would choose as, in all probability, his more accomplished and trustworthy host, the owner of the Italian villa.

Of the sixth class, is the "cottage of gentility"; its title justified by the art-improved, yet rustic and secluded character of its position. No objection can be made, under such circumstances, to the barge-boarded gable, the thatched roof, the unbarked posts of its verandah, and the semi-Gothic doors and windows.

To the seventh class, belongs the dwelling of the artisan and industrious poor in towns; and to the eighth class, the farmhouse and the cottage of the agricultural labourer. In the last two classes, some important improvements are being made; for in these, perhaps, more than in any other, the principles above propounded have been truthfully and studiously acted upon.

It is thought that some model design, preeminently suited to a building of each class, can be conceived. These designs, published in a proper form, would constitute a work worthy of the nation, and such as might speedily occasion a general move towards the ultimate establishment of a national architecture.

GEORGE WIGHTWICK.

THE ELEMENTS OF DESIGN,

EXTRACTED FROM

THE SECOND CHAPTER OF THE FIRST BOOK OF THE WORK

DE ARCHITECTURA.

BY

MARCUS VITRUVIUS POLLIO.

LIBER I. CAPUT II.

EX QUIBUS REBUS ARCHITECTURA CONSTET.

ARCHITECTURA autem constat ex ordinatione quæ græcè *τάξις* dicitur et ex dispositione: Hanc autem græci *εὐάρθεον* vocitant et eurithmia et symmetria et decore et distributione quæ græcè *διανομία* dicitur: Ordinatio est modica membrorum operis commoditas separatim uniuscuiusque proportionibus ad symmetriam comparatio hæc componitur ex quantitate quæ græcè *ποσότης* dicitur: Quantitas autem est modulorum ex ipsius operis sumptu et singulisque membrorum partibus universi operis conveniens effectus: Dispositio autem est rerum apta collocatio elegansque compositionibus effectus operis cum qualitate: Species dispositionis quæ græcè dicuntur *ἰδέαι* sunt hæc ichnographia ortographia scenographia ichnographia est circini reguleque modicæ continens usus æqua capiuntur formarum in solis arearum descriptiones. Ortographia autem est erecta frontis immago modicæ picta rationibus operis futuri figura: Item scenographia est frontis et laterum abscedentium adumbratio ad circiniquæ centrum omnium linearum responsus hæc nascuntur ex cogitatione et inventione: Cogitatio est cura studii plena et industriæ vigilantiaque effectus propositi cum voluptate: Inventio autem est questionum obscurarum explicatio ratioque novæ rei vigore mobili reperta. hæc sunt terminationes dispositionum Eurithmia est venusta species commodusque in compositionibus membrorum aspectus hæc efficitur cum membra operis convenientia sunt altitudinis ad latitudinem latitudinis ad longitudinem et ad summam omnia respondeant suæ symmetriæ: Item symmetria est ex ipsius operis membris conveniens consensus ex partibusque separatim ad universæ figure speciem late partis responsus uti in hominis corpore e cubito. pede palmo. digito cæterisque particulis symmetros est eurithmiæ qualitas sic est in operum perfectionibus

DE ÆDIBUS SACRIS.

Et primum in ædibus sacris aut e columnarum crassitudinibus aut triglypho. aut etiam embatere ballistæ foramine quod græci *περίρρητον* vocitant. navibus interscalmio quæ *ἐπιρρητική* dicitur: Item cæterorum operum e membris invenitur symmetriarum ratiocinatio: decor autem est emendatus operis aspectus probatis rebus compositi cum auctoritate. is perficitur statione quod græcè *θεωρησις* dicitur seu consuetudine aut natura: Statione cum jovi fulguri et cælo et soli et lunæ ædificia sub divo hypæthraque constituentur horum enim decorum et species et effectus in aperto mundo atque lucenti præsentibus vidimus minervæ et marti et herculi aedes doricæ fieri. his enim diis propter virtutem sine deliciis ædificia constitui decet: Veneri flore proserpinæ fonticum phisconinthio genere constitutæ. aptas videbuntur habere proprietates quod his diis propter ténertatem graciliora et florida foliisque et volutis ornata opera facta augere videbuntur justum decorem junoni. diane libero patri cæterisque diis qui eadem sunt similitudine si sedes ionicæ construantur habita erit ratio medicocritatis quod

ARCH. PUB. SOC.

BOOK I. CHAPTER II.

On those things of which Architecture consists.

ARCHITECTURE consists of Ordination, which in Greek is called *τάξις*; Disposition, which the Greeks name *εὐάρθεον*; Eurithmy; Symmetry; Fitness; and Distribution, which in Greek is termed *διανομία*.

ORDINATION is the adjustment as to size of the members of the work in themselves, in reference to their uses, and as compared with the scale of the entire design. This arises out of dimension, which in Greek is called *ποσότης*. Dimension, however, depends upon the agreement of each part of the members of the whole work, with a module assumed from the work itself.

DISPOSITION is the just collocation of the parts, and the desirable effect in the composition of the work, with regard to quality. The drawings for the disposition, called by the Greeks *ἰδέαι*, are these: plan (ichnography), elevation (orthography), and perspective view (scenography). The Plan is the accurate delineation by compass and rule, from which is taken the form of the areas on the surface of the ground. The Elevation is the vertical representation of the front, and the figure of the future work, accurately drawn in proportion. The Perspective View is the shaded representation of the front and receding sides, and accordance of all the lines to the vanishing point. These are founded upon thought and scrutiny: Thought being the consideration, *con amore*, of the proposed subject, carried out with care, industry, and vigilance: Scrutiny being necessary for the solution of obscure questions, and to give the reason, for any novelty, discovered by quickness of apprehension. Such are the operations comprehended in the term DISPOSITION.

EURITHMY is the graceful form and suitable appearance in the composition of the parts. This is realised, when the members of the work are in proportion—of height to width, of breadth to length—and where all agree to the perfection of their own proportion.

SYMMETRY, also, is the proper harmony of the members of the work itself, and the agreement of any given one of the several parts with the appearance of the whole; as in the body of man, there results, from the elbow, the foot, the palm, the finger, and the other parts, a symmetry (which constitutes a quality of eurithmy); so also there is (a like relation) in the perfections of buildings. And, as in sacred buildings, from the diameter of the columns, or from the triglyph, a scale is found; as in the balistæ, by the size of the hole which the Greeks call *περίρρητον*; and in ships, from the space between the thovls, which is termed *ἐπιρρητική*; so in other works from the members will be found a settled scale of symmetries.

FITNESS is a correct aspect of a work composed of parts, approved with the sanction of precedent or authority. It consists of propriety (in connexion with the destination of the building), in Greek termed *θεωρησις*; of (accordance with) custom; and of (attention to the) nature (of the site). The first

et ab severo more doricorum et ab teneritate corinthiorum temperabitur eorum institutio proprietatis: Ad consuetudinem autem decor sic exprimitur cum ædificiis interioribus magnificis. Item vestibula convenientia et elegantia erunt facta. si enim interiora perfectus habuerint elegantes aditus autem humiles et inhonestos non erunt cum decore: Item si doricis epistylis in coronis denticuli sculptentur. aut in pulvinatis columnis. et ionicis epistylis capitulis exprimentur. tricliphis translatis ex alia ratione proprietatibus in aliud genus operis offendetur aspectus
 60 aliis ante ordinis consuetudinibus institutis: Naturalis autem decor sic erit. si primum omnibus templis saluberrimæ regiones aquarumque fontes in his locis idonei eligentur. in quibus fana constituantur. Deinde maxime æsculapio saluti et eorum deorum quorum plurimi medicinis ægri curari videntur: Cum enim ex penitenti in salubrem locum corpora ægra translata fuerint et e fontibus salubribus aquarum usus subministrantur cælerius convalescent. ita efficietur uti ex natura loci majores auctasque cum dignitate divinitas excipiat opiniones

DE OSTEIS OPERUM ET BALNEARUM ET FENESTRIS.

70 Item nature decor erit. si cubiculis et bibliothecis ab oriente lumina capiuntur: balneis et hibernaculis ab occidente hiberno pinacothecis et quibus certis luminibus opus est partibus a septentrione. quod ea cæli regio. neque exclatur. neque obscuratur solis cursu: sed est certa inmutabilis die perpetuo.

DE QUALITATIBUS LOCORUM ET COPIS OPERUM.

Distributio autem est copiarum locique commoda dispensatio parcaque in operibus sumptus ratione temperatio. hæc ita observabitur si primum architectus ea non quæret quæ non potuerunt inveniri aut parari nisi magno Namque non omnibus locis
 80 harenæ fossiciæ nec cæmentorum. nec abietis. nec sappinorum. nec marmoris copia est. sed aliud alio loco nascitur quorum comportationes difficiles sunt et sumptuosæ. Utendum autem est ubi non est harena fossicia fluviatica aut marina lota:

Inopiæ quoque alietis aut sappinorum vitabuntur utendo
 85 cupresso populo ulmo pinu reliquaque his similiter erunt explicanda:

Alter gradus erit distributionis cum ad usum patrum familiarum et ad pecuniæ copiam aut ad eloquentiæ dignitatem ædificia alte disponuntur:

90 Namque aliter urbanas domos oportere constitui videtur aliter quibus ex possessionibus rusticis influunt fructus: Non idem feneratoribus aliter beatis et delicatis potentibus vero quorum cogitationibus res publica gubernatur. ad usum conlocabuntur et omnino faciendæ sunt aptæ omnibus personis ædificiorum
 95 distributiones.

This text is taken from the codex ascribed to the ninth century, and numbered 2767 of the Harleian Collection in the British Museum. It has been collated with the other codices in the same library, of which the following are the respective numbers: Harleian, 2508 (A), 2760 (B), 3859 (C), 4870 (D); Cottonian, Cleopatra, D. 1. (X); Arundelian, 122 (F).

The letters affixed to each, distinguish the authority from whence the notes are derived, being the several readings of the various manuscripts; the material differences only having been noticed.

The codices are all written without regard to punctuation; but the selected one has been strictly adhered to in that matter. It will be observed, that generally a pause is distinguished by only one point, while two mark the close of a period.

The subdivisions of this chapter are probably injudicious interpolations of the mediæval transcribers.

Line 2, *ex* omitted, A; 1. 3, *vocant diatesin*, A; 1. 6, *positionis for proportionis*, D; 1. 7, *has componunt*, A; 1. 9, *sumptione*, F; 1. 14, *equa*, A F; continentur formarum, A; 1. 14, *e qua.....in solis*, D; 1. 21, *explanatio*, A; 1. 21, *ratione*, C D B; 1. 34 and 35, *interscalpio*, C D B; 1. 38, *probatus rebus compositionis*, D; 1. 41, *constituerentur*, A; 1. 42, *videmus*, A D F; 1. 45, *Fontium nymphis*, D; *Fonti cum phis*, E; *Fonti cum phis*, altered in margin into *Fontium nymphis*, C, and into *Fontium nymphis*, F, from *Flora* to *justum decorem* omitted, A, *Fontium phiscocorinthio*, B; 1. 48, *augeri*, E; 1. 49, *constituentur*, B; 1. 53, *cum ædificiis magnis*, C B; 1. 55, *perspectus*, F; 1. 57, altered in margin into *pulvinatis capitulis et ionicis epistylis exprimentur triglyphi*, F; 1. 62, *eliguntur*, D; 1. 74, *certa et immutabilis*, C D E F; 1. 76, *autem operum est*, C E; 1. 78, *eam non.....potuerit*, D; 1. 79, *nisi cum magno*, B D; 1. 79, *non in omnibus*, C; 1. 80 and 84, *sappinorum*, D B; 1. 83, *aut maxime lota*, A; 1. 88, *aut ad pecuniæ*, F; 1. 90, *aliter est quibus*, A; 1. 92, *alter*, C.

directs, that temples to Jupiter Thunderer, and to Cælus, and to the Sun, and to the Moon, be erected without roofs, and hypæthral; for we see around us the effect and appearance of these deities in the open air and broad light. To Minerva, Mars, and Hercules, Doric temples should be built; for to these gods, because of their masculine valour, it is proper that buildings should be erected without ornament: edifices in the Corinthian order to Venus, Flora, Proserpine, and nymphs of fountains, will seem to be appropriate, because more graceful and florid works, ornamented with volutes and adorned with leaves, will seem to be better adapted to the feminine character of these deities. If to Juno, Diana, Bacchus, and other gods who are like unto them, Ionic temples should be built, then will be attained a due mean, because the style suitable for them is a modification between the severity of the Doric, and the delicacy of the Corinthian.

In respect of custom, too, fitness is in like manner maintained, when buildings with magnificent interiors have suitable and elegant vestibules. For if the interiors should be elegant, but the entrances of poor and mean appearance, there would not be fitness. So, if in the Doric entablatures, dentils be carved, or if triglyphs be introduced in the entablatures on pulvinated capitals and Ionic columns, proprieties of one style being transferred into another, the sight will be offended, from the use of peculiarities contrary to established custom. But natural fitness will thus arise; for if healthy sites and fountains of water are thought necessary in those places, in which shrines are to be raised to any of the gods, then especially would they be so in the case of Æsculapius, of Salus, and of those divinities by whose medicine many sick men are seen to be cured. For when invalids are transferred from a pestilent to a healthy place, where the supply of water is furnished from pure springs, they will the sooner convalesce. Thus it will result from the nature of the place that the divinity will be more thought of, and held in greater reverence.

Also the fitness as to nature will be attended to, if for chambers and libraries light be obtained from the east; for baths and winter apartments, from the west; for picture-galleries and others, in which a steady light is required, from the north; because that region of the sky is neither made lighter nor darker in the sun's course, but is steady and unchangeable throughout the day.

Distribution is an advantageous use of the materials and site, and a frugal expenditure in the execution. This will be observed, if the Architect does not ask for those materials which cannot be found or procured except at great expense. For there is not in every place plenty of pit-sand, cement, fir, larch, or marble, but one or other may be procurable only in another locality; and the carriage, consequently, difficult and expensive. So that, where there is no pit-sand, river or sea-sand must be used, being first washed. The want of the fir or larch may be obviated by using cypress, poplar, elm, or pine: other difficulties, also, may have to be got over in like manner.

Another branch of distribution is, when the buildings have to be arranged according to the wants of the head of a family, or in proportion to the wealth, or to the dignity of eloquence of the owner. For it appears, that city houses should be arranged in one way; but a different distribution must obtain in the residences of those, who derive their means from the produce of their lands; one system for traders; and another for the rich and luxurious; but for the powerful, by whose thoughts the state is governed, the houses must be adapted to their position; and, in short, the arrangement of buildings must ever be suited to the wants of the persons requiring them.

It is not intended to present the above translation as a literal rendering of the text of the English codices in particular, but rather of what is presumed to be a faithful representation of the original text amended by reference to other authorities.

OBSERVATIONS.

ARCHITECTURE may very properly be regarded in a three-fold view, under those distinct courses of study necessary to produce the perfect Architect, whom Vitruvius describes. It is a science; an art of design; and a practical or mechanical art. Under all these three aspects does our author contemplate it, in the opening of his work. He begins the first chapter by considering it as a science, embracing an extensive range of knowledge, both theoretical and practical. The former of these branches, admitting only of a general treatment, in a work of his scope, he disposes of in the same chapter, recurring to it occasionally, as opportunity offers; but the *practical* knowledge necessary for an Architect, so far as it can be gleaned from writing, he discusses at considerable length, in the latter chapters of the first, and the whole of the second, seventh, and eighth books.

In his second chapter, he proceeds to consider architecture as an art of design (or the *rationatio artis*, as he elsewhere calls it), having reference to practical utility; and lays down very distinctly, and with equal truth and beauty, those principles or elements of composition, by which every architectural design should be tested, before it is put into execution.

In his third chapter, after specifying the three heads, under which architecture, as then practised, ranged itself, he adverts briefly to the points requiring attention in the *opus* or *mechanical* execution of the design.

It is under the aspect explained in the second chapter, that we wish more particularly to consider the subject, on the present occasion.

This chapter, more, perhaps, than any other part of the writings of Vitruvius, not even excepting the *scamilli impares*, the *de harmonia*, or the *vasa theatri*, has been an enigma and a stumbling-block to all those who have undertaken, either to explain or translate the text of our author. Barbaro and Scamozzi, though at great pains to elucidate it, have left it involved in rather greater obscurity than originally invested it. Philander and Poleni, despairing of throwing any light upon it, have left it untouched; and Perrault hesitates not to say, that "no one can discover the essential difference of ordinance, disposition, and distribution in a building, nor how proportion can be considered as distinct from these, seeing they can none of them be effected without attention to this principle"; and in his translation, resigning all hope of arriving at the true sense of the text, he manifests a characteristic boldness, in altering it to suit his own conceptions of the should be, wisely judging that to be the readiest means of solving this gordian knot. Lastly, Newton, with somewhat more show of modesty, acknowledges that the words seem put together in such a manner, as to have neither "coherence nor sense".

The translators have been scarcely more happy. Barbaro and Orsini, Perrault and Martin, Newton and Gwilt, have all fallen into errors, more or less gross, either in the rendering of specific words, or in the general conception of their author's meaning.

It is indeed matter of no surprise that all this obscurity should exist. Vitruvius confessedly compiled his treatise, in most part, from Greek authors; and he endeavours to embody and explain their lessons of art in a tongue, into which their terms had never yet been translated. Moreover, he is, in this part of his work, treating *in the abstract* a subject of much abstruseness. He is the only author we possess, either Greek or Roman, who has treated upon that subject; and even he handles it in a very concise and summary manner, presupposing his Roman reader to be prepared by education to understand a technical classification familiar in the schools of his period. The difficulty is yet increased, by his using, perhaps unavoidably, a confused phraseology, in employing the same term to explain one of his six principles, which he makes to express another.

It is owing to the ambiguity arising from our ignorance of his

technical terms in their true force and meaning, and the consequent doubt that hangs over many of his passages, that his writings have, of late years, lost, instead of gaining, in general estimation with the professors of the art of which they treat. In this age of railway rapidity, when royal roads to every attainment are expected on all hands, and books, of more or less pretension and merit, have been multiplied in every department of art, no wonder if the old-fashioned, dry, and uninteresting because unintelligible, pages of a Latin author, are in danger of being discarded for the supposedly more rational and practical works of a later date. The architectural student, anxious to come at once at the fundamental principles of his profession, sits down to consult the father and oracle of the art. Scarcely have his fears of final success been excited by a summary of the talents and acquirements necessary for an Architect, before he is arrested in his studies by a metaphysical disquisition not easily comprehended, and of which, should he venture to consult any of the general interpreters, he is not likely soon to arrive at the meaning. Discouraged and disgusted because disappointed, he impatiently closes the book; and instead of attributing his failure to his own want of apprehension or perseverance, he concludes that the author was either lunatic, or ignorant of that which he professed.

Such a mode of study will not suffice for an Architect. The necessary knowledge is not to be gained but by diligent and persevering application; nor is it, when obtained, to be reduced to practice, with anything like good effect, without unremitting attention and repeated assays.

That the Greeks had reduced their architecture to a highly elaborated system, and studied it upon scientific principles well digested, can, I think, scarcely admit of doubt, if we only remember that—They so greatly excelled in its practice;—They were a people loving philosophical investigations of every description;—We have still remaining elaborate and deeply argumentative treatises upon the arts of speaking, writing, and other sciences and non-plastic arts;—The subjects treated of are reduced to first principles;—They had public schools and places of general resort, where such questions were constantly agitated; and spent all their time (the Athenians at least) in hearing or telling some new thing; and, finally, they actually wrote elaborate works on architecture, the names of many of which have descended to us.

Rome derived her knowledge of art from Greece. The concurrent testimony of all history affirms that—

Græcia capta ferum victorem cepit et artes
Intulit agresti Latio.

Vitruvius professes to give us the six Greek divisions of architectural design, in the chapter under consideration; and the only reason for doubting its authenticity or correctness, is a certain obscurity with which his statement is supposed to be enveloped. If, then, it can be shown that he gives a just analysis of architectural design,—that the terms he uses are appropriate and consistent,—and that the order in which he places them is just and natural; a service will be rendered to the study of the art, and a powerful argument supplied in favour of the genuineness and authenticity of our author. The attempt is the more inviting, on account of the utility connected with it: for though any information respecting the *vasa theatri*, or the *scamilli impares*, may be more curious than useful, or, at the least, but seldom available for practical purposes, any light thrown upon the passage in question, would render it serviceable in every design we can possibly form, in whatever style conceived.

The principles of composition, which Vitruvius would have us ever keep in mind in the formation of an architectural design, are stated in the extract at the head of this essay, and are six:—

ordination, disposition, eurithmy, symmetry, decor (or fitness), and distribution.

Of these, the first is, perhaps, the most difficult, and certainly the most important, to comprehend and distinguish from the rest. And here let me premise, that it is not to be supposed that any one or more of the distinct principles here enumerated can exist totally independent of the others, any more than the elements of words can have their due, or indeed any, sound, without the assistance of each other.

ORDINATION, Vitruvius defines as "the adjustment as to size of the members of the work in themselves, in reference to their uses, and as compared with the scale of the entire design." Newton translates this passage thus: "Ordination is the proper modification of the members separately, and the regulation of the whole proportion and symmetry." But this is more nearly a definition of architecture generally, as an art of design. He has evidently been led into this error by taking the Latin word *ordinatio* in the same sense as we use the word Order. But that this is not its true sense, is evident from the fact, that Vitruvius makes here no reference whatever to the orders, but speaks *generally*; so that the whole of what he lays down in this chapter is equally applicable, whether an order be employed or not, which it could not be, if the very first step in the formation of a design must necessarily be the selection of an order. Besides, this definition, as Newton renders it, omits the three essential particulars noticed in the original, viz.,—the size of the parts, included in the word *modica*, their use, *commoditas*, and the general scale of the whole structure, *universæ proportionis symmetriæ*.

Galiani translates it, "un misurato comodo de' membri di una fabbrica presi separatamente, e'l rapporto di tutte le sue proporzioni alla simmetria"; a rendering very similar to the former, and almost equally defective. This is the more remarkable, because Galiani adds in a note, that ordination means the giving to the members of an edifice the size due to their use; an annotation, by-the-by, which he has borrowed from Perrault, without acknowledging its author.

This latter, as already stated, proposes to alter the text, as the only means of making sense; an alternative not justified, so far as I can find, by any manuscript; and I think unnecessary, as perhaps any one will allow, who compares the above rendering with the original text.

The translation of Jean Martin is scarcely more correct: nor is that of Orsini; both of whom seem to have been at a loss for the real meaning of their author.

Barbaro translates it thus: "Ordine è moderata attitudine de i membri dell' opera, partitamente e rispetto a tutta la proporzione al compartimento, il quale si compone di quantità"; a definition which defines nothing, but serves rather to conceal the meaning of the author than to explain it.

Sir Henry Wotton considered that *ordinatio* meant merely the adoption of a module for the whole work; a misconception to which we may probably trace Newton's error. He also imagined that *dispositio* was simply the plain expression of the forms or ideas of the design; so that he did not hold it necessary to include these two in his enumeration of the principles of architectural composition.

As, then, the translation above given requires no emendation or forcing of the text, is in itself plainly intelligible, and is borne out by Perrault, Gwilt, and Schneider, I hesitate not to adopt it. According to this, then, ORDINATION is that principle of our art, which requires us to give to the parts of our designs their appropriate size; for instance, to the several apartments, sufficient area for the purposes to which they are dedicated, without making them disproportionately large for the whole structure. It requires us to give to our doorways, corridors, stairs, etc., sufficient width; to our windows sufficient size for the requisite supply of light; and to our walls and other supports, sufficient thickness or strength.

There is, however, one difficulty to be met. The term *ordi-*

natio seems rather to express arrangement, than adjustment of size. How, then, does it admit of such an interpretation as we have given it?

We must here, in the first place, observe, that as Vitruvius professes to derive his knowledge from Greece, so he employs all Greek terms; and it is therefore to Greece that we must look for a solution of the question. Now the term *ordinatio* he explains by *τάξις*, which is no doubt the original word, of which *ordinatio* is a correct translation. Both express the marshalling or setting in array of an army. And here we must not forget the difference between ancient and modern warfare; in the former of which success depended more on the courage, prowess, and martial eloquence of the generals, and in the latter upon their skill.

The tactics of Grecian warfare were particularly simple. The troops of the several states were drawn up under their respective leader; but nearly, or quite, in a straight line; and the whole issue trusted to a single onset. With little or no cavalry, and no chariots or elephants, their battles elicited none of the manœuvres, which the use of gunpowder, and especially artillery, has given rise to in modern times. The disposition of an army involved but little idea of arrangement: the chief points were, to bring all the forces into the field; to marshal the natural divisions under their officers; and the general's skill was displayed in apportioning his troops to the several departments of the field. In forming them in a phalanx, fifteen or twenty deep, to make the attack, or in a line to receive it; in determining that his *ἑμβέλιον* or *κοιλίμβολον*, his *πλευθίων* or *πύργος*, should consist of so many *λόχοι* or *τάξαι*, his phalanx be *ὀρθία* or *πλαγία*, as circumstances seemed to require. So an Architect's skill in ordination, consists in apportioning a given space and amount to the several uses involved in drawing out, as it were, before him, a muster-roll of the several apartments and other necessary parts in due order, according to their several stations and importance in relation to the whole.

Or, if we imagine the terms to be employed only in their general acceptation, of setting in order, without reference to an army, the parts of a building may be said to be set in order without reference to actual location, when the most important is made the largest, and the next in importance is also next in size, and so on, in regular gradation; in which also there seems to be some similarity to the form and subordination of an army.

The second principle enumerated by Vitruvius, DISPOSITION, and the Greek *τάθεσις*, both have exactly the same meaning, viz., the placing in order according to some given system of classification, or, as Vitruvius here defines it, "the just collocation of the parts, and the desirable effect in the composition of the work with regard to quality." As, then, ordination gives us the sizes according to their uses, so disposition teaches us how to place them together, both according to their use (*apta collocatio*) and the general effect in the composition. This term, Mr. Gwilt translates "arrangement"; but as that is mostly applied to the construction of the plan, and Vitruvius goes on to show that he means every species of collocation, I prefer the more general term of disposition.

EURITHMY, the third division, Vitruvius says, is "the graceful form and suitable appearance in the composition (or compounding) of the parts"; and is realized, he adds, when the members are of a height suitable to their width, and a breadth proportioned to their length; and, in short, when all things accord to their own proper proportion.

"So SYMMETRY (the fourth), he adds, "is the proper harmony of the members of the work itself, and the agreement of any given one of the several parts with the appearance of the whole"; where the words *ipsius operis*, and *universæ figuræ*, are evidently opposed to the word *membrorum* in the definition of eurithmy. And yet so little has this part been understood, that I have not been able to find any one translation in which it is properly rendered, and the distinction maintained.

Barbaro, though he translates correctly the last clause of the definition of eurithmy, *omnia respondeant suæ symmetriæ*, which

is generally construed as though it were *universa symmetria*, "the proportion of the whole", but which he renders "ogni cosa risponda al suo compartimento proprio", yet confounds the whole by a note, in which he says, "symmetry is the beauty of order or ordinance, as eurhythmia is of disposition"; whereas neither one nor other of them have anything whatever to do with disposition or location of any kind.

Perrault considers eurhythmia and symmetry as synonymous, and translates them "eurithmie ou proportion", adding, in a note, that all previous commentators had thought *eurithmia* and *symmetria* as distinct, because they seemed to have different definitions, whereas, in reality, they were one and the same.

Galiani has fallen into an equally remarkable error. He has confounded the Latin *compositio* and *dispositio*; and has expressly stated in a note, that eurhythmia means the equal distribution of the members of an edifice, so as to produce a pleasing effect, especially making the left-hand side accord with the right.

In like manner, Mr. Gwilt translates *symmetria* "uniformity", evidently misled by the authorities above quoted.

Newton has had a pretty just conception of the distinction, for he says in a note, *eurithmia* seems to refer to the proportion of a member in itself; *symmetria* to the relation of proportion of the members to each other and to the whole: yet, strange to say, he adds, "they are very similar", and then renders the text in the usual and corrupt manner, translating *sua symmetria* "to the symmetry of the whole"; adding in his comment, that eurhythmia is "the agreement of parts with each other and with the whole"; which is exactly the only sense that can be put upon his rendering of the definition of symmetry, except that he there interpolates the word "same".

Our only other translator (Jos. Gwilt) renders the former of these two definitions very nearly as does Newton; and for the latter he furnishes a fresh definition, so as to suit the new sense he has given to the word *symmetria*.

It seems, indeed, that the whole of the confusion above noticed, has arisen from forgetting that every member has at least two dimensions which must bear certain relations to each other, as well as to the whole of the composition; an error which would have been at once corrected, had the word *compositionibus* been translated as a substantive, which it is, instead of as a gerund, which it is not. The former construction shows clearly that the author had reference to the composing or forming of the members out of their fundamental parts of height, width, and length, as a chemical compound is formed out of its simples.

This, it is evident, is the meaning of Vitruvius, by the term eurhythmia. As he defines it, it is applicable only to the ratios of the several dimensions of one member or part, whether it be the width and height of a façade, a door, window, or other feature; or the relation of the length, width, and height of an apartment; the depth and projection of a cornice; the diameter and height of a column, etc. That this is the sense in which Vitruvius employs the term is clear; for this is secured, he says, when the members are of a height suitable to their breadth, of a breadth suitable to their length, and, in fact, when all things answer to their own proportion or symmetry,—a passage where the word *symmetria* is used in a general sense, for it is not to be supposed that he would explain one of his six principles by another.

Hence it appears how utterly unfounded is the idea of those writers, who state, that either of these terms signifies the equal and similar distribution of the parts, on the right and left of the centre. Were any argument necessary to show this falsity, it is furnished by the fact, that about one-half of those who find this principle laid down by Vitruvius, discover it in the word eurhythmia, and the other half in *symmetria*. Hence we might naturally infer, that it is justly discoverable in neither.

In like manner, then, as eurhythmia regards the relations of the dimensions of any single member, symmetry refers to the relations of one member to another, or of any given dimension of one member to the corresponding dimension of another. Eurhythmic proportion exists between the height of a column and its

diameter; symmetric, between the height of a column and the height of the entablature, and also between the diameter of the column and the width of the intercolumn. Eurhythmic, between the width and height of a door or of a window; symmetric, between the door as a whole and the window as a whole, or between the widths and the heights of the two respectively: eurhythmic, between the length and height of the whole façade; symmetric, between the centre and wings, and between either of these and the whole façade, and so on.

The expression "in good proportion" is therefore either very extensive or very indefinite; for it either means that the thing spoken of is in good proportion, both as a whole, and also as a part of a whole, or else it does not express of which nature is the proportion approved, whether eurhythmic or symmetric.

That *symmetria* has nothing to do with location, is clear from its derivation, which as plainly expresses the comparison of one thing with another, in respect of magnitude, as it is possible for words to express: literally, it is "a measuring together", or one against the other, as if to determine which were the greater. Some have been misled by our author employing the members of the human figure to exemplify his definition; arguing that as they are set uniformly one opposite to the fellow, that was what Vitruvius meant. If so, he would have used the plural number, and repeated the preposition, and said, as in the human body the hands, feet, etc., are symmetrical, so in perfect works, etc. But not so: his language is, *ut in hominis corpore e cubito, pede, palmo, digito, cæterisque partibus symmetros est*, etc., i.e., as between the cubit, foot, palm, and finger—measures taken from the human body, there exists a symmetry of proportion, so is it in perfect works. Besides, the *digitus* is not properly said to be uniformly placed, unless the uniformity is stated to exist on the two hands, and not on the one.

And again, he goes on to specify certain measures, such as the diameter of a column, the triglyph, etc., which determine the dimensions of all other parts of the composition in which they occur: so that he clearly establishes two kinds of proportion, eurhythmic and symmetric.

The fifth element of architectural design which our author lays down, is *decor*, or *FITNESS*, by Newton translated "propriety", and by Gwilt, "consistency". He defines it as "a correct aspect of a work composed of parts, approved with the sanction of precedent or authority." This, he says, is three-fold, according to the grounds upon which it proceeds, whether that be of what he calls *statio*, or of custom, or of nature. The first of these has been variously translated: station, Newton calls it; and Gwilt, circumstance; Barbaro, stanza; Orsini, abitazione; Martin, situation d'un lieu; Perrault, état des choses; and Galiani, statuto. Vitruvius explains it by the Greek *θεμελιώδης*, from *θεμελιζω*, to lay down a fundamental principle. For instance, he says, temples to Minerva, Mars, and Hercules, should be Doric, because, owing to the stern attributes of those deities, their shrines should be without delicate enrichments; but temples to Venus, Flora, etc., should be Corinthian, in accordance with the tender nature of these divinities. Here it would seem that the fundamental principle that required to be laid down was the distinctive attribute of the deity to whom the temple was to be dedicated, and which, being known, the style of the composition would be determined. Here we may observe that considerable latitude was left for selection; for, according to the exact aspect under which the deity or object of the erection was contemplated, so the style would be varied. Thus, at Athens, to Minerva, as the goddess of war, the Parthenon, of the Doric order, is dedicated; but to the same divinity, regarded as the tutelary deity of the city, the promoter of peace, and the protector of arts, a temple of decorative Ionic order is erected.

Conventional propriety, or consistency as regards custom, requires that established usages, which have been approved in all ages, should not be infringed; for instance, that triglyphs should be introduced in no other order but the Doric; and again, that dentils be not admitted into the Doric. The other illustration

given by Vitruvius of conventional propriety, viz., that magnificent internal structures should be approached by spacious and elegant vestibules, might perhaps appear more appropriate to his third division, viz., natural propriety. But, in fact, this latter refers only to external nature, *decor naturalis* Vitruvius calls it, which every Latin scholar knows is not synonymous with natural decor, but is that which requires the structure to be judiciously located, and arranged with respect to the natural objects, phenomena, or peculiarities by which it is surrounded; for instance, aspects, healthy or appropriate localities, and the like. But the consistency of styles alluded to, depends upon association of ideas, which results from experience or habit, and is, therefore, appropriately ranged under the second division.

The sixth and last principle that he establishes is DISTRIBUTION, explained by him as "an advantageous use of the materials and site, and a frugal expenditure in the execution." Most of the commentators have imagined that because their author proceeds at once to give certain advice respecting economy in materials, that this is mainly or solely the object of *distributio*. But if a little more consideration were devoted to the Greek term, which we must insist upon regarding as the true original, we should more clearly arrive at his meaning. The Greek word is *oikonomia*, a term which expresses the entire control and arrangement, not only of the household affairs, but of the whole estate and its resources, and is more nearly rendered by our word "stewardship" than by any other in our language. Now, as in a Greek establishment it was the office of the *oikonomos* to provide for all the requirements of the family and of the estate, and yet to husband the resources, so it is the province of architecture, under this aspect, to furnish all the requisite parts of the design (without lavish expenditure), in such manner and measure as may best accord with the circumstances of the case. *Oikonomia*, therefore, as a scientific term, was particularly appropriate, and very judiciously introduced by our author, as explanatory of his Latin word, which, though the nearest translation his language afforded, is by no means adequate to express the force of the original.

It seems, then, that according to Vitruvius, the principles of architectural design are—ORDINATION, by which the parts are made of a size appropriate to their use; DISPOSITION, by which they are placed in convenient and effective collocation; EURITHMY, or the due adjustment of the parts in themselves; SYMMETRY, or the unity of proportion between all the parts and the whole; FITNESS, or propriety, or consistency; and DISTRIBUTION, or economical provision of the essential requisites.

Sir Henry Wotton, as already stated, considered that ordination and disposition were redundant in this explication. But if we have properly understood them, all the parts of a design might be well proportioned in themselves, and a unity of proportion might run through them all; they might also be consistent as regards appropriateness of style to the object proposed, custom, and external nature; and every requisite might also be furnished without inordinate expense: and yet, if ordination were neglected, some of the parts would be too small for their use, in proportion to the general scale, and others larger than necessary; or the parts might even be correct in these respects, and yet, unless disposition were studied, be inconveniently contrived, or so arranged as to produce a clumsy or weak effect.

Nor, on the other hand, was Perrault more correct, when he supposed that if ordination and disposition were properly attended to, all other requisites must necessarily be secured. For an edifice might be very convenient, both in respect of the magnitude and arrangement of its parts, which might in the essential dimensions be proportioned to their uses and the general scale, and the effect arising from arrangement be the best they admitted of; yet the apartments, though of sufficient area, might be too

low or too long for their width to be elegant or noble; sufficient light might be admitted at very ill-proportioned windows; the entrance, though wide enough, might be inelegantly low, or absurdly high; the vestibule, though large enough for useful purposes, and appropriately situated, yet not consistent with the spacious saloons; or the design might be correct in all the above particulars, and yet be abundantly too expensive for execution, or when executed, useless, because, forsooth, there was no staircase to the upper floor, or, if a palace, no state rooms in which to hold the levees.

In like manner, the ordination, disposition, consistency, and distribution, may be perfect; and there may be also unity of proportion, but that very clumsy or very weak; or the proportions of eurithmy may be very good, and yet one part of the edifice in Doric tone, and another in Ionic, and a third Corinthian. And so, were we to ring the changes, we should not find one of these six elements with which we could dispense.

On the other hand, that design, which provides all the essential requisites, so far as expense and circumstances will admit, thereby fixing the general scale of the composition; which proportions their sizes to their uses on this general scale; and which arranges them in the most convenient manner, is complete in the *utile*; and if it also affixes graceful proportions to all these parts, and entwines them with a oneness of ratios, so far as is consistent with their usefulness, and then places these graceful parts in good relative positions, maintaining consistency throughout; such, we say, is a perfect design, so far as art can make it. That it may be clever, good, beautiful, or deserve any of the other hackneyed epithets, we do not assert. This depends not upon education, but upon talent; not upon acquired, but upon natural, power in the designer.

This analysis of the theory of Vitruvius is, therefore, not only correct, but also visibly exhibits all the elements of the compound, and the order in which they are placed is just and natural. First, the parts are procured of appropriate size; then justly arranged as to convenience and effect, which, as there can be only one arrangement, must be a single act; but this must be done with reference to eurithmy, both as regards ordination and disposition, and these must again be adjusted according to symmetry. Next, we must see that the consistencies are maintained; and, lastly, that everything essential is provided, and not too much expense incurred. The only doubt that can exist, is whether distribution should not come first; for ordination, disposition, eurithmy, and symmetry, must of necessity come together, and *decor*, or consistency, as a restriction, follow. But as distribution is, after all, the grand restrictive clause, it very properly accompanies *decor*, and with equal consistency closes the catalogue.

If this be so, then, as far as the limits of a paper like the present will allow, I have succeeded in making good my original proposition, or, at all events, in showing that in this case, at least, the text of Vitruvius is not "sophistical twaddle", as it has been called, "put together by an ignorant compiler, who scarcely possessed the most crude and childish notions on the subject treated of." I have endeavoured to show that it is an admirable explication of the subject when elicited, in all the views in which it can be regarded. True, it is not easy to make it out, on account of its minute sub-division and subtle analysis,—a characteristic feature of Greek philosophy and metaphysics,—as well as from the absence in ourselves of a like methodical investigation of the operations of the mind, which leaves us unprepared to appreciate its fitness. It is the original of every similar attempt, but equalled by none; and the author, whoever he was, is worthy of our highest admiration, entitled to our warmest thanks.

WILLIAM WILLMER POCOCK, B.A.

THE DICTIONARY OF ARCHITECTURE.

WAGG

WAAST and WAST (JEAN). See VAAST (J.).

WADD. A carburet of iron, PLUMBAGO, used in making black-lead pencils for drawing.

WADY. A road or camel track across a desert in Egypt and Arabia. STANLEY, *Sinai and Palestine*, 8vo., 1857; 4th edit. BEAMONT, *Cairo to Sinai*, 8vo., Cambridge, 1861.

WADY OWATAIB or Mecaurat, near Shendy, in Nubia. There are immense ruins in an enclosure 760 by 660 ft., of the period of Ergamenes, contemporary with Ptolemy II. CAILLIAUD and prof. HEEREN both describe them, the latter as the Ammonium. HOSKINS, *Ethiopia*, 4to., 1835, p. 94-100.

WADY SABOOAH, or Valley of the lions, in Nubia, so called from the eight androsphinxes on each side of the *dromos*, terminated by two statues, and two pyramidal towers of the propylon; the area with eight Osiride figures attached to the pillars; and interior chambers, rock cut, and thickly plastered, in which the hieroglyphics have been impressed while wet. A. B. EDWARDS, *Up the Nile*, 4to., 1877, ii, 528. 28.

WAGER, waye, and wey. An old term for a quantity of lead; see CARRAT. FORMELLA. Fodder or FOTHER.

WAGES. The price paid for labour. Only professional books are here named. GERBIER, *Counsel and Advice to all Builders*, 8vo., 1663. PRIMATT, *City and Country Purchaser*, 12mo., 1680. FLEETWOOD, *Chronicon Preciosum, for 600 years* 8vo., 1707; 1745. SMITH, *Antiquities of Westminster*, 4to., 1807, p. 200 *et seq.* BRITTON, *Architectural Antiquities*, 4to., 1812, iii, 31; iv, 4. BAYLEY, *History of the Tower*, fol., 1824-5. BRITTON and BRAYLEY, *Palace of Westminster*, 8vo., 1836, p. 148 *et seq.* HUNT, *Tudor Architecture*, 4to., 1830. TOOKE, *History of Prices, from 1793*, 8vo., 1838-57. THIERS, *Discours sur le droit au travail*, Sept. 1848. *Domestic Economy of the Romans in the IV century*, in BREWSTER, *Journal of Science*; and MIRROR, x, 312. MACAULAY, *History of England from accession of James II*, 8vo., 1849. S. SMIRKE, *Condition of Workmen*, in *Builder Journal*, 1849, vii, 146. RILEY, the *Liber Albus* of the City of London, 8vo., 1859. GENTLEMAN'S MAGAZINE, 1865, April, prints the wages 5th Elizabeth, 1562-3. BAINES, *History of Lancashire, prices 1202-1576*, 8vo., 1868-70, i, 260. SOCIETY OF ANTIQUARIES, *Archæologia, Wages at Okeham* 1610, xi, 208; xvi, 231; and Index, 4to., 1889. J. E. T. ROGERS, *Prices in England 1259-1793*, 8vo., 1888. DICKSON, in SURVEYORS' INSTITUTE, *Transactions*, 1890, xxiii, 25. Also the Household books, Privy Purse Expenses, and Wardrobe accounts.

WAGET and wachet. See WATCHETT.

WAGGON or WAGON SHED. These should be formed about 18 ft. in height and of ample size so that two or more loaded wagons can enter and remain there for the night, secure from rain and ready to start betimes in the morning for market.

ARCHITECTURAL PUBLICATION SOCIETY.

WAGT

They should face the north, to prevent the sun affecting the wooden materials inside; and be near the stable for speedy and convenient harnessing. The roof should have an extra projection of a few feet to prevent the slanting rain from entering. At one end should be the drill or tool-house, not alone for tools but for those implements that take to pieces, being only used at harvest or other annual periods. VERRELT, *Remarks on Farm Buildings*, 12mo., 1856.

WAGGON ROAD. A width of 15 feet is usually allowed.

WAGGON ROOF or VAULT. A roof, semicircular in section, but somewhat higher than a semicircle or BARREL roof, by rising from vertical sides. The barrel vault was the earliest form introduced, presenting a uniform concave surface throughout its length. In the chapel of the Pyx at Westminster abbey are two bays of the work of Edward the confessor; its bays, the cross passage to the little cloister, and the dark cloister, are waggon-vaulted, formed of tufa laid in rubble work still showing the impression of the centering boards on the mortar; SCOTT, *Gleanings*, in INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1859-60, p. 4; and *Gleanings, etc.*, 8vo., Oxford, 1863, 2nd edit., p. 10; and *Lectures*, 8vo., 1879, i, 238; ii, 87-93. "En berceau surbaissé" (elliptical), in VIOLETT-LE-DUC, *Dict., s. v. Construction*, p. 125; and "berceau," s. v. Voute, p. 466. The work of the Roman period, in CHOISY, *L'Art de bâtir chez les Romains, s. v. Voutes en berceau*, fol., Paris, 1873, p. 47-71.

WAGHEMAKERE (HERMAN DE), born *cir.* 1440; was 1474 engaged on the ambulatories and upper portion of the north-west tower and on other parts of the cathedral at Antwerp. In 1491 he commenced the church of S. Jacques-le-Grand, and on his death in 1502 or 1503 the works were continued by his two sons DOMINIC and Herman (b. *cir.* 1475, died *cir.* 1545). WEALE, *Belgium, etc.*, 8vo., 1859, p. 183, 231, 235, 258.

WAGHEMAKERE (DOMINIC), born *cir.* 1475; in 1503 succeeded his father and carried on the works at the cathedral at Antwerp until 1530-41, when the funds were exhausted; and in 1516 he was employed with others at the maison au pain at Bruxelles (*Messenger des Sciences*, 8vo., Ghent, 1842, p. 42); and in 1527 with R. Keldermans and E. Polleyn, at the hôtel de ville at Gand, when was pulled down part of the façade erected by J. Stassins, making a new design of which only the lower portion of the side in the rue Haute Porte was executed, the works being discontinued *cir.* 1560. He died *cir.* 1550.

WAGT (CONRAD), 1515-20 designed and built the chapel of S. Martin, next that of S. Laurent, in the cathedral of Strassburg. As grand-master of the masons of Germany he obtained 3 Oct. 1498 from the emperor Maximilian I, the confirmation of their statutes. GRANDIDIER, *Essais—sur la Cath.*, 8vo., Stras., 1782, p. 76, 423.

WAID (STEPHAN), had worked on the building of the chapel of the Holy Ghost at Esslingen, and in 1492 was recommended by his brother-in-law Mat. Boeblinger to the chapter as his successor; his mark, on the north-east buttress of the east gable wall, is given in HEIDELOFF, *Kunst des Mittelalters in Schwaben*, 4to., Stutt., 1855, p. 50, 53. He was *baumeister* 1496-1505 at Ulm minster. 92.

WAILLY (CHARLES DE), and Dewailly, born 9 November 1729 at Paris; studied under Blondel and Lejay and Servandoni. In 1752 he obtained the *grand prix*; 1754-7 was in Italy with his friend P. L. Moreau Desproux ("Moreau et Douilly," 19 January 1757, at work on the restoration of the *thermes* of Diocletian; BARTHÉLEMY, *Voyage en Italie*, 2nd edit., 8vo., Paris, xi (1802), letter 43); and 1767 admitted into the academy of architecture. He designed the interior decorations of the hôtel de marquis de Voyer d'Argenson, rue des Bons enfans; château des Ormes in Touraine; those for the salon, etc., in the palazzo Spinola or Serra, at Genoa, for the architect A. Tagliacico. 1778, No. 1 (the middle of three houses) rue de la Pépinière, faubourg S. Honoré, for himself; 1776, No. 2 on left hand, for Pajou, sculptor, and 1779, No. 3 not completed; KRAFFT ET RANSONNETTE, *Maisons et des hôtels à Paris*, fol., Paris (1802?), pl. 43-5. 1779-82 with M. J. Peyre the théâtre de l'hôtel de Condé; in 1794 l'Odéon, near the palais de Luxembourg (LE GRAND, ii, 91); the roof is given in KRAFFT, *Charpente*, fol., Paris, 1805, pt. ii, p. 21, pl. 58: PEYRE, *Reconstruction*, fol., 1819; it was burnt 1799. The château de Mont Musard for ... de Voyer d'Argenson, in KRAFFT, *Arch. Civile*, fol., Paris, 1812, pl. 27-8. 1787 the chancellerie of the duc d'Orléans; maison d'un sieur Duvivier in rue Richelieu; important modifications to the salle of the théâtre des Variétés, the comédie Française, des Italiens, later opera comique, in Palais royal, 1787-90 by Louis (LE GRAND, ii, 94), with a façade in the rue Richelieu. The *surélévation* of the choir, and the design of the lower chapel of the church S. Leu S. Gilles, rue S. Denis (LE GRAND, i, 145); and the completion of the chapelle de la Vierge in S. Sulpice (LE GRAND, i, 125); and the pulpit (126). At Versailles for Louis XV a chapel in rue Hoche, for the service of the Fête Dieu, now a protestant chapel. The salle de spectacle at Bruxelles. 1781 the obelisk to Louis XIV at Port-Vendres, which with the harbour was engraved 1780 in two plates by Matthey; (BORDIER ET CHARTON, *Histoire de France*, 8vo., Paris, 1860, ii, 398; 401); 1790 the plans for the pavillon de Hingene, near Antwerp, completed in 1794 by A. M. J. Payen (GOETGHEBUER, *Mons. des Pays Bas*, fol., Ghent, 1827, p. 24). 1797 he competed for the reconstruction of the salle of the théâtre Favart obtained by P. T. Bienaimé. The landgrave of Hesse Cassel employed him to make designs for the embellishment of his capital; these are in the library at Cassel in two volumes. The empress Catherine II offered him the post of president of the academy of architecture at S. Petersburg, but it is doubted if he accepted it. Many of his designs are engraved in the *Encyclopédie*; and in LABORDE, *Description générale de la France*, fol., Paris, 1781. He drew and engraved a set of six vases. He was appointed architecte et ingénieur géographe du roi; and was called the "Palladio of France"; and was (1767) recommended by the king as member of the académie des beaux-arts, but not being elected 27 April 1771, he was nominated a member on its reconstruction in 1795 as the academy of painting, sculpture, and architecture. Baghenov, Estarov, Pagenov, Volkov, B. Poyet, C. Norry, and L. F. Petit-Radel, were amongst his pupils. He wrote *Adresse à l'Assemblée Nat.*, 14 Feb. 1791, 4to. *Vues sur le Panthéon Français*, etc., in DÉCADE PHILOSOPHIQUE, 8vo., Paris (1796?). *Cat. de tableaux ... et estampes; du cabinet de C. de W.*, 8vo., 1810. He died 2 November 1798 at the Louvre. Paris: INSTITUT NATIONAL, *Mémoires*, 4to., Paris, 1798-1804, iii, 36, 166, 188. ANDRIEUX, *Notice sur la vie et les ouvrages de C. de W.*, 8vo., Paris, 1779 (?). LA VALLÉE, *Eloge historique*, Paris, 1799. LANCE, *Dict. Biog.* DUSSEUX, *Les Artistes Français*, 8vo., Paris, 1856, p. 31, 190,

290, 414. LE GRAND ET LONDON, *Descr. de Paris*, 8vo., Paris 1808. 68.

WAINE, wainey, waney, wany, wainny, and wemhe. "Waime", a Suffolk term for a flaw or tear; HALLIWELL. The *Assise of Bread*, 1528 (?), required "that the same tymber and bourde be cleve without sappe or wemhe upon payne to be punyshed by the mayre and aldermen for the tyme beyng". 1669-70 "well seasoned deales without waine or sapp"; Trinity College, in WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 8vo. Cambridge, 1886, ii, 558; iii, Glossary, 623. The girders prove commonly somewhat wainny upon their upper sides and the joists are always scribed to project over that wainyness and so strengthen their bearing; MOXON, *Mechanick Exercises* (Carpentry), 4to., edit. 1694, p. 136. "Fir is dearer than elm by the foot, yet it is cheaper to use the former, as there is so much waste in the latter, occasioned by the elm being in general what the workmen call very wainy"; WOOD, *Cottages*, 8vo., 1788, p. 12. "Pine, both red and white, birch and mahogany are not squared, or only so partially as to be designated wany, that is, they are of less dimension on the outsides than in the centre; so that in sawing up the timber the outer planks vary very considerably in depth from the middle ones, often as much as from 4 to 6 ins."; DUBLIN BUILDER *Journal*, 1859, p. 161. BUILDER *Journal*, 1860, xviii, 31. "Occasionally are quoted some 'wainey timber' for board purposes, or 'wainey board timber' (yellow pine); these logs are not so perfectly hewn or squared as ordinary timber and are usually short butts of trees, which are very clean in the grain, free from knots, and solid in the centre"; LASLETT, *Timber and Timber Trees*, 8vo., 1875, p. 277, who writes "all the timber to have the bark on the wanes", p. 224.

WAINSCOT, Wainscot, and Wainescotte (Dut. *wandeschort*; tabulatum opus; BARET, *Alvearie*, fol., London, 1573. Dut. *wandschotten*, or *woeghen schotten*; wand, a wall, and *schotten* to defend, close; LEMON, *English Etym.*, 4to., 1783: KENNETT, *Parochial Antig.*, p. 375. The cote or boarded covering of a wain or waggon, as "carpentry" is derived from *carpentum*, a waggon). ESTREGE BOARD and EASTLAND BOARD have not been cleared up as meaning wainscot or fir. LIDHOLT. 1.

That description of oak which is known in England as wainscot, and sold as such in the trade (Ger. *wagen schooss*) was originally used for the seats of waggons. It is cut out of trees in the forests of Volhynia, of 28 to 30 ins. diameter, furnishing logs of from 14 to 15 ft., or at least of 7 ft. clean timber free from branches; the shorter ends are cut up for staves. The log is cut in half, and the pith if unsound cut away; two side slabs are then cut away, sent down to Riga and shipped as "crown English wainscot" and "crown Dutch wainscot", and "second quality". It is then sawn into planks, and after exposure to the action of the atmosphere for three years it is considered ready for use; BUILDER *Journal*, 1846, iv, 364. The wainscot from Holland is rare, and much esteemed for firmness and good figure; in floats on the Rhine, along the Main, Moselle, and Soar, to Andernach. Dantzic oak, brought down the river Vistula; to Memel and Stettin. It is esteemed for planks, straight and clean and almost free from knots, crown and crown brack—planks 2 to 4 ins. thick for the navy, "fresh, clean, free from defective wanes, cut regular, square-edged, and straight." Riga and Dutch wainscot are employed in the fittings of the internal parts of buildings; Riga possesses greater strength and the Dutch more figure and easier under the tools. Memel oak is used for pipe-staves, being much inferior to Riga oak used for wainscot. In the new Houses of Parliament, Contract No. 7, interior fittings, 20th Dec. 1847, it is specified that the wainscot to be used in the joiners' work is assumed to be from the best Crown Riga wainscot, in the logs, and from pipe staves of the best quality in equal proportions, to be prepared for use by steaming or otherwise. If thoroughly dry wainscot boards seasoned, if natural means were used an additional price was to be allowed. DONALDSON, *Specifications*, 8vo., 1860, p. 457-8.

The figure is obtained by converting the timber in such a manner as to show the silver grain, *i.e.*, obliquely across the medullary rays, as shown in VIOLLET-LE-DUC, *Dict.*, s. v. Menuiserie, vi, 346-7.

American white oak, *quercus alba*, nearly as strong as English oak, is not much used in London; it is very elastic and when steamed may be easily bent. The Canadian oak, *quercus rubra*, is much imported for use by cabinet-makers and dealers for furniture only. The Baltimore oak is used for general purposes in carpentry, as it is easy to work and stands well after seasoning. The Italian oak is hard to work, and in seasoning is apt to split and leave deep shakes on the exterior of the log, and therefore unfit for conversion into planks.

1398 Bordarum de Estland que vocatur waynescot, p. 542; and p. 556, Waynescote; see EASTLAND.

1365-6 600 boards called waynscoot, price £1 per 100. BRITTON AND BRAYLEY, *Westminster Palace*, 8vo., 1836, p. 190.

1368-9 Estlich boards called wainscot for doors, windows, and roofs of Rochester castle; FREEMASONS' MAGAZINE, 4to., 1862, vi, 405.

1371 RIGOLD TIMBER. 1418 RAGOLD, Rygholtz (MOULD).

1374 Tabellarum de vanscot. *Coldingham Roll*.

1413-16, 1-4 Henry V. 200 boards called regold, waynyschoote, and estrychehoorde bought for making moulds thereof, £4 4s. 10d.; at Westminster abbey; SCOTT, *Gleanings*, 8vo., 1861, p. 66.

1419 "joynor—planacione et gropyng de waynscott"; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., London, 1859, p. 39.

1425 Et in vi Estregbords videlicet waynscots emptis apud Steresbrugge, ii sol iii den.; KENNETT, p. 575.

1460-7 "xl waynscote emptis de W. Clarke, precium *vd.*, xvjs. viiij^d," and 1486, waynscots, waynscowttes; SURTEES SOCIETY, *Finchale Priory*, 8vo., Newc., 1837, p. 301. 376, 458.

1510 For a wainscot, 1s. 2d. For sawing of the wainscot for the bell wheels 6d. NICHOLS, *Illustrations of the Manners, etc., of England*, 4to., London, 1797, p. 109.

1515-16 "c waynscot 57s. 4d."; *York Fabric Rolls*, p. 96.

1532 18 waynscotts, 12s.; POUSSON, *Beverlac*, 4to., 1829, p. 640.

1542-3 Called oak plank board.

1547 "for ii waynscotte boards for the high altar, 1.0d. Also for the wryghtyng of the Scriptures upon the same boards, 5.0d." NICHOLS, *S. Margaret's Westminster*, p. 12.

1556 Receipt for payment for 100 of wainscoting at Somerset place; *Addit. MS.* 5755, fo. 280.

Dois de Hollande, ou des Vosges; ROMÉLOT, *Bourges*, 8vo., Bourges, 1825, p. 97.

WAINSCOTING (Late Lat. *lambrascatura*; Fr. *lambris*). So called from the foreign species of oak named WAINSCOT, which was first used for the purpose of lining internal walls by framed boarding *temp.* Henry III (1216-72), who painted it, as a species of decoration, succeeding to the fashion of tapestry, in the Tudor (*temp.* Henry VIII, s. v. SELLING) and later styles of English architecture. It generally consists of panelling for the whole of the wall, or for almost three parts up it; when about 3 ft. or 4 ft. high it is called "dwarf wainscoting." PANEL. LINEN PATTERN. TURNER, *Dom. Arch.*, 8vo., Oxford, 1851, p. 85, 90, 184. The walls of the refectory of the colleges were as bare as those of the chambers. At Durham 1518 the frater-house was wainscoted 2½ yards high above the stone bench; the hall of Eton college was not wainscoted till 1547, before which, hangings were used. In 1531-42 the hall of Queen's college was put, about 8 ft. high of "linen panels" (now in the Lodge); WILLIS AND CLARK, *Arch. Hist. Cambridge*, 4to., Cambridge, 1886, ii, 44; iii, 357, etc. Some joiners put charcoal or wool behind the panels to prevent the sweating of the stone and brick walls from unglueing the joints; the most effectual way is by priming over the back-sides of the joints well with white lead, Spanish brown, and linseed oil; *Vanbrugh's Letters*, in *ROY. INST. OF BRIT. ARCHITECTS, Journal*, 1890-1, Letter No. 34, p. 38. The terms in use for the several parts of wainscoting are explained in MOXON, *Mechanick Exercises* (Joinery), 4to., 1678; 3rd edit., 1701, p. 105-6.

Cypress and cedar wood have been used for wainscoting. When *fir* or *deal* was actually first used is not clear (compare ESTREGE BOARD, s. v. 1253). The church of S. Paul's Covent garden was "wainscotted about the chancel with deal and pewed

ARCH. PUB. SOC.

with oak" in 1631-8; SEYMOUR, *Survey of London*, fol., 1735, ii, 672. In the reign of queen Elizabeth (1558-63), two bathing rooms at Windsor castle were described as "ceiled and wainscotted with looking glass"; BREWER, *Palaces*, 4to., 1810, p. 115. The Lollards' Tower at Lambeth palace had the upper story lined with elm. MATCHBOARDING is a sort of "wainscoting". BOARDING.

Wainscot floor; see POLISH. PARQUETRY.

WAIR. A piece of timber two yards long and a foot broad; 1736.

WAIST, wast, or waste, of a CHIMNEY or funnel. Where the shaft is gathered into its least dimensions.

WAIST MOLDING "four feet above the floor four inches one half wide"; the capping to a dado: UNIVERSAL MAGAZINE, 1754, xv, 321.

WAITING ROOM. In a private house, especially in towns, the dining-room is always subject to be used during the morning as a waiting-room for the gentleman's visitors; the library should be left quiet. In the servants' department in large houses, an ante-room, or corridor, or some equivalent space, should be provided for messengers or tradespeople waiting; sometimes the servants' hall is so used, but this is not always a convenient arrangement. ANTEROOM. LOBBY.

A waiting room is usually provided at a railway station, often for each class of travellers, with a ladies' waiting room and conveniences.

WAITZEN, Waatzen, Waizen, Wats, Vaccia (*Hung.* Vacz or Wacz, Lat. *Vacium*). A town near Pest, in Hungary, situated on the river Danube, which here forms the island of S. Andrew. A few Roman remains have been found, which are placed in the gardens of the palace. The cathedral, dedicated to the Virgin, was built 1761-77 for cardinal Migazzi, on the model of S. Peter's at Rome, on the design of C. Canneval under the Piarist Oswald; it has a twelve-columned portico, two towers 126 Ven. ft. high; and is considered to be the finest in Hungary after that at Gran. There are other churches for the roman catholics, protestants, Armenians and the Greeks, each denomination living in a separate district. The magnificent episcopal palace 1777 has good gardens. 26. 28. 50. 96.

WAKEFIELD. A city (created by royal charter dated 11 July 1888), in the west riding of Yorkshire, situated on the river Calder, crossed by a bridge of eight arches, *temp.* Edward III (1327-77); the chantry chapel to the Virgin Mary on a starling and island was built at same time by sir Edward Knollys; and refounded by Edward IV, after the battle in 1460; it was much restored 1847 by sir G. G. Scott, at a cost of £2,500, when the original front was removed to and set up at Kettlethorpe Park; the parapet and parts were again restored 1889-90; it is used for service: illustrations in *BUILDER Journal*, 1890, lix, 406. Heselden hall in the town dates *temp.* Henry VI (1422-61) and 1583; the "Six Chimblies" in Kirkgate is half-timbered. A Roman mint was found at Stanley near the town. The cathedral dedicated to All Saints, formerly the parish church, was consecrated 1329 on rebuilding; the chancel rebuilt 1458. The building is 156 ft. long and 69 ft. wide, with 1420-40 a tower 22 ft. wide inside and a spire 228 or 237 ft. high, and clerestory. It was restored 1857-86 by sir G. G. Scott at a cost of £30,000 for the new diocese of a bishop, May 17, 1883; WALKER, *History of Wakefield Cath. Ch.*, 8vo., Wakefield, 1888. There are other churches and some chapels. An assembly, concert-rooms and library (Ionic), a court-house 1806; 1877-80 the town hall, by T. E. Colcutt, *BUILDING NEWS Journal*, 1877, xxxvi, 1879; p. 706; 720; a large house of correction for over 900 (DIXON, *London Prisons, etc.*, 12mo., London, 1849-50); a market cross *cir.* 1730 (Doric) with a room over; theatre; Tammy hall, 210 ft. by 30 ft. for sale of stuffs, now a power-loom factory; free grammar school 1592 in good buildings; pauper lunatic asylum for the riding, 1817 for 250 persons (WATSON AND PRITCHETT, *Pauper Lun. Asylum*, fol., 1819), since enlarged for 400; large exchange 1823 and 1827 with hall for

public meetings; corn market; and warehouses for holding 200,000 quarters. BAINES, *Yorkshire Directory*. ALLEN, *Yorkshire*, 4to, 1831. 14. 28. 50.

WAKEFIELD (WILLIAM), of the family of Huby hall, north riding of Yorkshire. He appears to have been a resident architect at the following buildings designed by sir John Vanbrugh:—17... Gilling castle, Ryedale, Yorkshire, for C. G. Fairfax, esq., with the exception of the keep, temp. Edward III (78 ft. by 73 ft. and 69 ft. high), and some other portions. Near it, 1713-18 Duncombe park, Yorkshire, for Thos. Duncombe, esq. (lord Feversham); also known as Helmsley; additions 1844-5 by sir C. Barry; entrance hall, 60 ft. by 40 ft., saloon 84 ft. by 24 ft., and end buildings connected by colonnades (NEALE, *Seats*, 8vo., 1824, 2nd Ser., i. CAMPBELL, iii, pl. 85-8). 1723 Atherton house, Lancashire, for Rich. Atherton, esq.; CAMPBELL, iii, pl. 89. 1724 Rookby park, Yorkshire, for T. Robinson, esq.; CAMPBELL, *Vitruvius Britannicus*, fol., London, 1725; 1731, iii, pl. 90. The date of his death has not been found.

WAKING RECESS. An Easter SEPULCHRE: in Holy Cross abbey, Tipperary; cut from CLOSE, *Holy Cross Abbey*, 1868, in BUILDING NEWS *Journal*, 1869, xvi, p. 200.

WALCH (REMI), or Panig Walsch (according to LANCE, *Diel. Biog.*, 1872), rebuilt the spire of the church of Thann, near Cologne, Haut Rhin; upon the octagonal portion are two inscriptions, one stating that the lower part was commenced on 8th day of the calends of August 1430; the other on the eight faces of the spire, 1503-16, as done by Walch. LABORDE, *Monuments de France*, fol., Paris, 1816-36, ii, p. 25, pl. 190.

WALDBERGER (WOLFGANG) flourished between 1560-1622, in Northingen, where he "built" towers, bastions, and several houses; and there are also sculptures by him in the churches; in the convent of the barefooted friars is his portrait in stone with that of his assistant Lazarus Straubinger. 68.

WALDIN, 1086 ingeniator, is mentioned in Domesday Book: he had lost his lands in Lindsey, Lincolnshire, by 1114-16, in Aslaoce, Bradley, and Wraghoe wapentakes; Roll of Landowners; printed in ASSOCIATED SOCIETIES, *Reports and Papers*, 1882, p. 175, 184, 193. 201.

WALDON (WATKIN), 1395 warden of the works at Westminster hall under H. Zeneley, or Yevele, master mason, who delivered "a form or model" to the masons J. SWALVE or Swallow and R. Washbourn. 19.

WALE. A strong plank extending along the side of a ship serving to reinforce the decks and form the curves of the vessel.

WALLING PIECE, is a piece of timber about 14 ins. by 7 ins. bolted on each side the heads of a row of piles to secure them together, being notched down on shoulders prepared to receive them.

WALHALLA. See REGENSBURG; and L. von KLENZE. 14.

WALK. See GRAVEL WALK. PAVEMENT. MILLER, *Gardeners' Dictionary*, fol. LONDON, *Country Residences*, 4to., 1806, ii, 414. *Cost of Gravel Walks*, BUILDING NEWS *Journal*, 1870, xix, 58-9.

WALKENRIED in Brunswick. The kloster 1207 was designed by the monks Jordan and Berthold: Heinrich III, abbot 1223-1231, was a clever architect, and kept twenty-one pupils (conversos), who worked in stone and metal under his direction: ECKSTORM, *Chron. Walken*, 4to., Helms, 1617, p. 87.

WALKENRIED (BERTHOLD VON), 1424 fabricated the vaulting of the klosterkirche at Maulbronn. 92.

WALKER (...), carried out before 1818 the designs of James Wyatt for Elvaston hall, Derbyshire, for earl of Harrington; NEALE, *Seats*, 4to., 1818, i.

WALKER (J... C...), of Edinburgh, studied under W. Burn and D. Bryce; assisted the former in London; and returned 1857 to Edinburgh. He designed the town halls of Dunfermline and Hawick, the free library at Dunfermline, and other buildings. He died before 20th January 1888, aged 66.

WALKER (S... D...), of Nottingham, studied at Rome, where he made drawings of many of the ancient buildings, and a restoration of the Forum; it was engraved on a large scale by W. A. Smith in 1837. 68.

WALKER (THOMAS LARKINS), F.R.I.B.A., designed 1838-9 All Saints' new church, Spicer street, Mile End new town, £4,095; 1839 Camp-hill house, Warwickshire, for J. Craddock, esq.; 1839-40 church at Attleborough, Nuneaton, Warwickshire, for earl of Harrowby (CIVIL ENGINEER, ETC., *Journal*, iii, 39); 1840-2 S. Philip's new church, Mount street, Bethnal green, £5,422; 1841 new hospital at Bedworth, Warwickshire (Specification in DAVY, *Precedents*, 1840); 1842 Hartshill church, Warwickshire, Norman (ILLUSTRATED LONDON NEWS, 1845, vii, 181). He published *Vicars Close, Wells*, 4to., 1836; *Manor House and Church at Great Chalfield, Wiltshire*, 22 pl., 4to., 1837; *Manor House of South Wrachall, Wiltshire*, and *Church of S. Peter at Biddlestone*, 28 pl., 4to., 1838, as vol. iii of PUGIN, "Examples of Gothic Architecture"; *The Church of Stoke Golding, Leicestershire*, 4to., 1844, for WEALE'S *Quarterly Papers on Architecture*; and edited DAVY, *Architectural Precedents*, inserting *Essay on Architectural Practice* (working drawings of Friars Mount church), 8vo., 1841. He removed to Nuneaton and then to Leicester, and restored the church at Ilkeston, Derbyshire; emigrated to China and died October 10, 1860, at Hong Kong. GENTLEMAN'S MAGAZINE, 1861, 3rd Ser., x, 337. He was co-executor to the will of A. Pugin to whom he had been a pupil.

WALL. A solid body, of stone or brick, of varying thickness, enclosing and supporting other works; or for forming a separation between properties. The *front* of a wall is usually termed the face, the inside is the *back* or *tail*, the interior is the filling in or core. When the face of the wall is sloped, the slope is called a batter. An "external wall" shall apply to every outer wall or vertical enclosure of any building not being a party wall. "Cross wall" shall apply to every wall used or built in order to be used as a separation of one part of any building from another part of the same building, such building being wholly in one occupation. "Party wall" shall apply to every wall used or built in order to be used as a separation of any building from any other building, with a view to the same being occupied by different persons; as prescribed in the Metropolitan Buildings Act 1855, and other local Acts for similar purposes. A wall is carried up in *courses*; when of stone it is called "regular coursing" when of equal heights, or "random courses" if unequal. When of brick, the courses are regular and laid in English or Flemish bond. A brick wall is improved by having bond or through courses of stone: while a rubble or ragstone wall is improved by heading courses of brickwork at short distances apart. All walls required to be protected on the top by a coping of brick or stone. "To ventyde, copyde, garyttede, lowpyd and crestyd; also dressyde and embattyld"; BAYLEY, *History of the Tower*, 4to., 1824-5, i, App. ix, xi, xii.

The thickness of a wall generally decreases as it rises, usually by half a brick at a time and usually on the inside. The thickness for dwelling-houses and warehouses, and for cross walls is detailed in the Metropolitan Building Act. The following

formula has been given: $\frac{l h^2}{d n}$ = thickness of wall, n being a

constant varying from 20 for warehouse and 22 for others.

RONDELET, *L'Art de Bâtir*, fol., Paris, 1812 (and in GWILT, *Encyc. of Architecture*, 8vo., 1888, § 1542), who gives the

formula $\frac{l \times h}{12 \times d}$. CLAUDEL, *Formules*, 8vo., Paris, 1854, p. 605-

610, s. v. épaisseurs des murs. HESKETH, *Enquiry as to the methods which it is most advisable to adopt in the Met. Buildings Bill for regulating the thickness of Walls*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1854-5, p. 103-14. Tiers of hoop-iron tend to strengthen brickwork. *Building of Walls*, by HONEYMAN, in THE ARCHITECT *Journal*, January 1, 1881, p. 12. SEDDON, *Practical Remarks upon Wall Masonry*, in CIVIL ENGINEER, ETC., *Journal*, 1863, xxvi, 65, 92, 126, 156, 192. 1. 4.

The following terms relating to walls are described in this work:—

OPUS, EMPLECTON, INSERTUM, ISODOMUM, QUADRATUM, and RETICULATUM; CYCLOPEAN MASONRY; DRYOTIC BUILDING; FORMARIUM;

MACERIA; MURUS; PARIES; PELASGIC; POLYGONAL WALL; PSEUDISOLONIUM.

BACKING OF A WALL; BACK OF A WALL; CARCASE; DWARF; FENCE; FOOTING; FOUNDATION; FRAME; GARDEN WALL BOND; HOLLOW; LIST WALL; PALISADE; PANEL; PARTITION; PARTY WALL; RETAINING WALL; SEA WALL; VALLUM; WHARF.

AMATITLAN; ASHLAR; BACKING; BACKING OF A WALL; BOARDING; BOULDER WALL; BRICK BOND; BRICK NOG; BRICKWORK; CASE OF CAGE; CLAY; COB; CONCRETE; COURSE; EARTH BUILDING; FACE WORK; FACING; FLANK; FLINT; FREESTONE; FRONT; HOOP-IRON BOND; MASONRY; PISE; PLAIN FACE; PLASTER; RANDOM COURSE WORK; RANDOM WORK; ROCK WORK; ROUGH CAST; RUBBLE WALL; RUSTIC WORK; SLATE; STONE; TAPIA; WEATHER BOARD; WHINSTONE.

BATTER; BATTLEMENT; BUTTRESS; COPING; DAMP; DAMP COURSE; DRY AREA; EFFLORESCENCE; HANGING OVER; HUMIDITY; INCLINATION OF THE FACE OF A WALL; MOISTURE; PERPENDICULAR; RAISING; SCREWING UP.

WALL DOCK. The same as WOOD BRICK, in LOUDON, *Encyc. of Cottage, etc., Arch.*, 8vo., 1833, § 925, p. 467.

WALL HOLD. The same as the "bearing at the end" of a beam; joists and lintels should have at least 9 ins.; binding joists 6 ins.; girders 9 to 12 ins.; BRES, *Glossary*, 1853, p. 42.

WALL HOOK. See HOOK.

WALL LINING. A thin internal wall of brick for keeping dry the interior surface of a house in exposed places. HOLLOW WALL.

WALL PLATE; called in the north of England, RAISING PIECE, REASON, REISON, or RESON; called PAN PIECE in Yorkshire. LINTEL. GROUND PLATE. PLATE or TASSEL. "Raising piece" lies on the top of a post or puncheon and under a beam; those that lie on brickwork and under the beams are PLAT BANDS (1736). A piece of timber placed along the top of a wall, to receive the ends of the tiebeams of a roof; in roofs of large span two ranges of timbers are used, to obtain a proper bearing. At Eltham palace is a double wall plate, side by side, the principal one 11 by 20 ins., wedged and pinned together; the inner side of it is molded and has the upper part of the cornice rabbeted into it and secured by wedges 12 ins. by 8 ins. and $1\frac{1}{2}$ in. thick; BUCKLER, *Eltham Palace*, 8vo., 1828, cut, p. 105. The Divinity school at Oxford was "in altitudine a fundo usque ad superiorem scalplate de frestone 80 pedes"; W. WYRCESTRE, *Itin.*, by Nasmyth, 8vo., Camb., 1778, p. 282. A wall plate is also sometimes used to receive the ends of the joists of a floor, or of rafters resting on a wall. 4. 19.

WALL STRAP. The same as BATTEN for lathing, in LOUDON, *Encyc. of Cottage, etc., Arch.*, 8vo., 1833, § 925.

WALL STRING. The side-piece of a wood stairs next the wall to receive the ends of the risers and treads. It is called "notch board" in Lancashire.

WALL TIE. A term given to pieces of slate, terra-cotta, and iron, used in connecting the two skins of a HOLLOW WALL, and so formed that wet passing through the outer wall shall drop into the space and not be transmitted to the inner skin. Some of the cast-iron forms have "nibs" to cock down in the work for additional strength. One of the earliest ties is shown in *BUILDING NEWS Journal*, 1869, xvii, p. 444.

WALL TILE. A tile secured to the face of a wall, or to any slightly sloping parts of a roof. MATHEMATICAL TILE. WALL VEIL. WHITE TILE.

WALL VEIL. A term used by prof. Ruskin for a skin covering the true material of the construction of a wall: it is chiefly a matter of decoration; INCRUSTATION; INLAY; LINING; MAJOLICA; MARBLE DECORATION; PARGET; VENEER; SHAM.

The surfaces of the walls in Venetian work were either entirely inlaid, or else inlaid within a square enclosing border of projecting moulding. The inlaying was composed of a number of slabs of marble, not always of the same size, supported to some extent by the projections of the enclosing

marbles or by those of the archivolt, but always dependent mainly on metal cramps, let into the fabric of the wall. When possible, these marbles were slabs cut out of the same block, and put side by side, so as to produce a kind of regular pattern wherever the veining of the marble was at all positively marked. . . . The most common faults of this system of incrustation must have been that upon a general surface of plain wall there would be here and there a square patch of marble surrounding a window opening. . . . This must certainly have been the case wherever the incrustation did not extend over the whole surface of the walls, and this was very frequent; STREET, in *ARCHITECT Journal*, June 4, 1886, p. 338-9. Not content with inserting in the walls, pieces of marble of a most beautiful kind, the opulent of Rome also had them painted and varied with different colours. This custom commenced under Claudius; under Nero they began to cover the marble with gold. Thus the marble of Numidia was gilded; that of Phrygia was stained with purple, "ut ovatus esset Numidicus, ut purpura distingueretur Synnadicus"; PLINY, lib. xxxv, c. 1. This explanation of *ovatus* is taken from BERGIER, who has brought together some curious passages on this subject. The mode of staining marble was so perfect, that the dyers of Lacedæmon and Tyre were envious of the purple lustre which the marbles exhibited; *Stat. Syl. in Epith. Stell. et Viol.* The house of Violantilla was adorned with Lilyan and Phrygian stone, and the green marble of Laconia (called *verd-antique*); pieces of solid gold, called *crusam aurum*, and of the same metal beaten out, called *bractee*, were attached to the beams. At Pednelissus, in Pamphylia, plates of thin marble were found by FELLOWS, *Travels in Asia Minor*, 8vo., 1852, p. 148. BRINDLEY, *Marble; its uses as suggested by the past*, in *ROY. INST. OF BRIT. ARCHITECTS, Transactions*, 4to., 1887, p. 45-56 and plates. The Greeks developed a system of veneering with terra-cotta, some of the finest examples of which have been found at Olympia and Selinus; the main stone cornice being blocked out and covered with moulded plaques of terra-cotta. A frieze was a thin plaque of the same material, its lower edge being finished by an astragal, and its upper edge by a moulding of slight projection forming the bed-mould to the ornamental gutter above. In Spain, the Seu at Zaragoza is formed of brickwork with coloured tiles (before 1350), by bricks arranged in patterns and the spaces filled in with small tiles; also at east end of the cathedral; STREET, *Gothic Arch.*, 8vo., p. 372, 439.

WALLACE (ROBERT), F.R.I.B.A., became a pupil of J. H. Good. In 1824 in a competition for the National Scotch church in Regent square, St. Pancras, his two designs were in the five selected and one approved later; but a rejected design was finally adopted (by W. Tite); he published *A Letter* with a view of the front. He 1836 competed for the new houses of parliament; gained 1837 the competition at Derby for the Atheneum and hotel adjoining, and Derbyshire and Derby bank (CIVIL ENGINEER, ETC., *Journal*, i, 254; ii, 34); 1823 competed for the additions, etc., at King's College, Cambridge; 1829-30 restored the two transepts, with the rich reredos of 1520-3 at S. Saviour's church, Southwark (DOLLMAN, *The Priory Church*, fol., 1881, p. 18, 21, pl. 31-2); 1842 remodelled the National Scotch church, Crown court, Covent garden (C. E. J., v, 33. *BUILDER Journal*, i, 267), which 1848 was enlarged by H. Roberts. He retired into the country about 1849 and was living in 1860.

WALLACE (WILLIAM), a burgess of Edinburgh, was 18 April 1617 appointed principal master mason to the king with a monthly salary of £10, as successor to J. Roytell. In 1620-23 he built Wyntoun house, Tranent, Haddingtonshire, BILLINGS, *Baronial Antiquities*, 4to., Edinb., 1845-52, ii, 1626-28 he was deacon of the old lodge of masons in Edinburgh. In 1628 he was tested as to his abilities by James Murray, master of the king's works in Scotland, and 22 January he designed and made a model and commenced Heriot's hospital, the first stone of which was laid 1 July; it much resembles Wyntoun.

He died on or after 29th October 1631, perhaps suddenly; and was succeeded on 17 Dec. by J. Mylne as master mason, and W. Aytoun, jun., at the hospital. GOLDICUTT, *Heriot's Hospital*, 4to., London, 1826; and *Hist. and Descr. Account*, edited by Johnstone, 8vo., Edinb., 1827. STEVEN, *Memoir of G. Heriot*, 16mo., Edinb., 1845; new edit. by Bedford, 8vo., 1859. D. LAING and D. RHIND, in ARCH. INSE. OF SCOTLAND, *Transactions*, 8vo., Edinb., 1852, ii, 17-39; 173-86; and *BUILDER Journal*, 1851, ix, 770. RITCHIE, *Report, etc.*, 8vo., Edinb., 1855, p. 18.

WALLEN (JOHN), born 1785, became a pupil of D. Alexander. He was largely engaged on the warehouses of the city, as the old warehouse, Milton street, Fore street, for Morrison and Co. 1843 repaired the Unitarian chapel, South place, Finsbury circus. Designed a block of buildings in Cateaton street, for Morley and Co. 1850 warehouse in Wood street, for Dent and Co., £7,336. 1852 repairs, etc., at the German synagogue, Duke's place (by J. Spiller). 1852 S. Mark's hospital for fistula, City road, £1,777. Among his many pupils were sir Horace Jones (died 1887). He died 13 February 1865, aged 80. He was a younger brother of William Wallen, surveyor, of Spital square.

WALLING. The making of a wall; and the wall when built.

WALNUT WOOD (*Juglans*). It is not known when this tree was introduced into England; but the wood was used for furniture and fittings during three or four centuries (*BUILDER Journal*, 1863, xx, 232) before the introduction in 1724 of mahogany. Of the time of Henry VIII (1509-47) is described the making of a great bedstead of "walnut tree", under William Kendall; (*Brit. Mus.*, MS. Sloane 1866, p. 33, given in TURNER AND PARKER, *Dom. Arch.*, 8vo., Oxford, 1859, iii, 105). It is still grown largely between the rivers Necker and Mayn. A finely carved chest of walnut wood of xv cent. is given in JACQUEMAIT, *Histoire du Mobilier*, 8vo., 1876, transl. by PALISER, 1878; and given in *BUILDER Journal*, 1878, xxxvi, 255, 265. Walnut wood is still used for furniture, frames for machines, gunstocks, and suchlike, and for shop-fronts in lieu of mahogany; the handsome veneers being retained for tabletops; the wood of the roots is beautifully veined. The timber is light, a cubic foot weighing 58½ lbs. wet, and scarcely 47 lbs. dry. The oil of the seed is used by artists in mixing white or any delicate colours, and as a drier on account of the rapidity with which it dries. The husks and root yield a dye.

The Italian walnut is a light brown, close-grained, with occasional dark veins, some waviness of figure, and hard; it only occasionally splits in seasoning. Planks 4 to 9 ins. thick, square-edged, 10 to 16 ins. wide and 5 to 12 ft. in length are imported. The Black Sea walnut was obtained from about 1806; it is about 10 to 18 ins. square, 6 to 9 ft. long, but a large quantity of "wane" is left upon the angles. The burs or excrescences are often 2 to 3 ft. across and 12 to 15 ins. thick; they are often prettily mottled or figured, and make rich veneers. The Black or Virginian walnut from North America was brought to England in 1656. The wood is whitish-brown in colour, and is heavier, stronger, and takes a better polish than the English; and is not so liable to be attacked by worms; nor is it liable to warp or to split. In Ohio and Kentucky it is used for shingles, door and window frames. The Grey or White walnut, the Butternut tree, will not bear comparison with the quality of either the Italian or Black Sea walnuts. MICHAUX, *North American Sylva*, 4to., Phil., 1817-9, new edit., 1850. LASLETT, *Timber and Timber Trees*, 8vo., 1875.

I. 4. 14.

WALRED (NICHOLAS). In the reign of Henry II (1154-89) he constructed the west bridge across the river Severn, at Gloucester; and whilst it was in progress built a house for himself and the workmen on land given by William Myparty, a burgess, who retired to them with others, and formed a college. Henry III, 26 June 1229 gave them the church of S. Nicholas and a charter of incorporation under the title of S. Bartholomew's hospital; a new charter was granted by Henry IV, 19 Nov. 1408. The building and bridge were only pulled down in

1809. BRITTON, *Picturesque Antiqs. of English Cities*, 4to. 1830, p. 54. RUDDER, *History of Gloucestershire*, fol., Cir., 1779, p. 201, and App. xxiv.

WALSCH (PUNIG). See WALCH (REMI).

WALSH. A term used at Leeds for a LEAN-TO.

WALSINGHAM (ALAN DE), was 1321 sub-prior, sacrist in December with care of the church, and Oct. 25, 1341, prior, all at Ely monastery. In 1314 he was described as an ingenious fabricator in gold and silver (WALSINGHAM, *Hist. Angl.*, Edw. II, fol., 1603, p. 104). 1321-49 erected S. Mary's or the Lady chapel, now Trinity church, with John de Wisbeach, a monk, as superintendent (ANGL. SACR., i, 651). 1321 erected the chapel for prior John de Craudene (died 1341), ARCHÆOLOGIA, 1808, xiv, 105-12, with plates by W. Wilkins: interior in *BUILDER Journal*, 1851, ix, 243, 251. The great tower (fell 12 Feb. 1322), was rebuilt 1322-28; and 1328-42 the timber vaulting and lantern (restored by sir G. G. Scott, 1864-6); described in ANGLIA SACRA, edit. by WHARTON, 2 vols., fol., 1691, i, 644; and by ROWE, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1875-76; also the three bays (middle pointed) eastward and stalls of the choir, under bishop Hotham (1316-37); the presbytery 1322 was completed before 1336. 1352 erected Little S. Mary church at Cambridge, where the tracery of the Decorated windows on the south side and east gable is in same style and in many respects with the same patterns as those of the lady chapel, and of the presbytery at Ely (WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., Cambridge, 1886, i, 51). A house on the north side of the infirmary of Ely monastery, is said to have been the dwelling of this sacrist and built by him. He is styled "vir venerabilis et artificiosus frater", HISTORIA ELIENSIS; LELAND, *Collectanea*, 8vo., 1770-74, ii, 604-6. His bust and that of John Attegrene, master mason, are carved as corbels on the north-west arch of the octagon (STEWART, *Arch. Hist. of Ely Cath.*, 8vo., 1888, p. 128). He died apparently in 1364, aged about 70; the exact place of interment in the cathedral is unknown; but the epitaph is preserved. KING, *Eastern Cathedrals*, Ely, 8vo. (Murray), 1862, p. 192-4; 218; 224-5. ARCHÆOLOGIA, 1792, x, 154. DALLAWAY, *Discourses*, 8vo., 1833, p. 416. BENTHAM, *Ely Cath.*, 2nd edit., 4to., 1812, p. 221-2. *BUILDER Journal*, 1883, xlv, 530.

S. Etheldreda's chapel, Ely place, Holborn, is shown in PUGIN, *Contrasts*, 4to., 1836. In Ely, it has been always understood that it was designed by Alan as his details are seen throughout; many plates of it are given in CIVIL ENGINEER, ETC., *Journal*, 1861, xxiv, 5 and 33. G. G. SCOTT, *Lectures*, 8vo., 1879, i, 181-4, 276, 314, with others, attribute the work to bishop de Luda, 1290-98; but others consider this too early a date for the work, and say *cir.* Edward II (1307-27), or about 1320. S. Michael's church at Cambridge is also said to have been erected by Alan; over the sedilia are the heads of Alan and of the master mason, counterparts on a small scale of their heads in the octagon at Ely cathedral.

WALTER LE MASSUX. "Walter Dixi cementarius de Bernewelle" conveyed land to his son Lawrence, 5th Edward I (1276-7), given in Cole's MSS., vol. viii; and in ARCHÆOLOGIA, 1844, xxx, 119, showing his seal consisting of a hammer between a half-moon and a star or sun. On a tomb to sir John Creke and lady Alyne, at Westley Waterless, Cambridgeshire, *cir.* 1352, at the right foot of the lady, is carved a similar monogram with a letter N under the hammer \mathfrak{D}^N ; WALLER, *Monumental Brasscs*, fol., 1842-64.

WALTER of Coventry, "one of the most renowned architects in England", may probably have had the direction of the whole undertaking of rebuilding from 1187 the cathedral at Chichester, consecrated 1199, for bishop Seffrid II "in a superior style of magnificence and durability"; the palace, cloisters, and the common houses are also attributed to him; HAY, *History*, 8vo., Chichester, 1804, p. 238, 261, 384, 444; who notices that MATTHEW PARIS (p. 261 of edit.?) highly praises Walter, and as "building many magnificent fabrics both sacred

and civil, in the reigns of Henry II, Richard, and John" (1154-1216). 1. 19.

WALTER OF COLCHESTER, living 1214-35, was sacrist of S. Alban's abbey; WALSINGHAM, *Gesta Abb. Mon. S. Albani*, 8vo., 1867, i, 233, 279-83, 286, says he was "pictor et sculptor incomparabilis". The shrine of S. Thomas à Becket in Canterbury Cathedral was the work of Walter and Elias de Dereham; it was in preparation for two years at least; MATTHEW OF PARIS, 1220, *Hist. Min.*, 3 vols., 8vo., 1866-9, ii, p. 242, the Rolls edition; who uses the terms "incomparabilibus artificibus" to the two.

WALTER DE HEREFORD; 1304. See HEREFORD (W. DE).

WALTER (JOSEPH CARL VON), 1766-70 restored and enlarged the burg at Innsbruck for Maria Theresa; 1771 designed the Damenstift; and the triumphal gate, the sculptures by baron J. von Spengler. 68.

WALTER (THOMAS USTICK), born 4 September 1804, at Philadelphia, where he 1831 designed the county prison; 1833-17 Girard college for orphans, at the time perhaps the finest specimen of the classic style in the United States (p. 266); and wrote *Description, etc.*, 8vo., Phil., 1837; LOUDON, *Arch. Magazine*, 8vo., 1838, v, 446-59. In Sept. 1838 he was in Italy studying the marble roofs for that building. He designed in the same style, the house for James Dundas, esq. (p. 288); and the mansion for Mat. Newkirk, esq. (p. 300); 1851-65 the large extensive additions to the United States Capitol at WASHINGTON, the dome was designed 1865; he published *Report of Architect on Extension of Capitol*, 8vo., Wash., 1864; designed the new Treasury building; and the government hospital for the insane. He was many years professor of architecture in the Franklin institute at Philadelphia; and was one of the founders of the American institute of architects. He was living at Philadelphia assisting in the erection of the new public buildings; *BUILDING NEWS JOURNAL*, 1883, xlv, p. 788, and aged. TUTHILL, *Arch. in the United States*, 8vo., New York, 1848, p. 266, 288, 300.

WALTER (James), 1825-7 designed the extension of the printing-house and dwelling-house on the site of the Cardinal's hat, in Trumpington street, which was carried out by Spicer Crowe, builder (iii, 135). 1835 he competed for the Fitzwilliam museum (iii, 204); WILLIS AND CLARK, *Arch. Hist.—Cambridge*, 4to., Cambridge, 1886.

WALTERS (JOHN), born 1782, educated at Bishops Waltham school, designed Sept. 1808-9 the Auction mart, Bartholomew lane, at corner of Throgmorton street; pulled down 1865. A description was published, 4to., 1809: ACKERMANN, *Repository of Arts*, 8vo., 1811, vi, 93-6. He wrote *Explanation of certain improvements—in Frame timbers of ships—to prevent hogging, etc.*, PHIL. MAGAZINE, 1815, xlv, 280. 1819 designed new church (Gothic) at Turner street, Stepney, behind the London hospital, to which institution he was surveyor. 1818-21 S. Paul's church, Shadwell High street, cost £14,000. 1826-7 S. Mary's church, Haggerston, Brunswick street, Hackney road. He married the sister of Edward l'Anson, sen., and left a son EDWARD and a daughter. He died October 4, 1821, aged 39, of exhaustion, at Brighton. CIVIL ENGINEER, *ETC.*, *Journal*, 1847, x, 381. GENTLEMAN'S MAGAZINE, xci, pt. ii, 374.

WALTERS (EDWARD), born December 1808 in London, was son of JOHN, on whose death the son entered the office of Isaac Clarke his father's assistant; and then of L. Vulliamy, J. Wallen, and J. Rennie, C.E., for whom he went to Constantinople, which he left about 1836 with W. H. Barlow, C.E., and settled at Manchester. He designed 1842 a church in Granby row (CIVIL ENGINEER, *ETC.*, *Journal*, v, 27). Baptist chapel, Oxford road. 1844-5 Oakwood hall, near Stockport (Tudor), for Ormerod Heyworth, esq. (TWYCRoss, *Mansions of England and Wales*, 4to., 1850, v, 129); 1845 warehouse for Silas Schwabe & Co., George street, corner of Grosvenor square; 1847 new Independent chapel, Cavendish street (ILLUSTRATED LONDON NEWS, x, 181), and its schools (COMPANION TO THE ALMANACK, 1850, p. 236). 1850 and later, numerous houses in the suburbs of

ARCH. PUB. SOC.

Manchester. Free church, Oxford street. 1851 warehouse for messrs. Browne & Co., Portland street; and others for messrs. Kershaw; messrs. Jackson; for R. Cobden (his patron), 16, Mosley street (*BUILDING NEWS JOURNAL*, 1858, iv, 158). 1853-56 Free Trade hall (*BUILDER JOURNAL*, 1856, xiv, 526; and ILLUSTRATED LONDON NEWS, October 11: T. R. SMITH, *Acoustics*, 8vo., 1860). 1860 Manchester and Salford bank, Mosley street; 1857 district bank at Warrington. 1860 stations on the Midland railway between Ambergate and Manchester for his friend W. H. Barlow, C.E.; 1860 London, Liverpool, and Globe insurance office, King street; and others. 1861 Warrington public hall; and also competed for the Manchester Assize Courts. He had retired in 1865 leaving his business to his pupils Barker and Ellis. He died January 22, 1872, aged 63, at Brighton. *Memoir* by l'ANSON, and Hall, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1871-2, p. 113. A fairly complete list of his works appeared in *BUILDER JOURNAL*, 1872, xxx, 199-201; 1858, xvi, 97, Art in Manchester.

WALTHER (meister), *steinmetz* von Esslingen, 1289, built the door of the stiftskirche, at Stuttgart. 68.

WALTHER (HANS), *baumeister* and sculptor, born 1526 at Breslau; made the model for the tower of the kreuzkirche, built 1579-82 by Melchior Berthel, *steinmetz*. He died about 1588. 68.

WALTON (NICHOLAS), is mentioned 1394, "pro N. W. magistro carpentario et depositore operum regis, quoad artem carpentarii, quamdiu se bene gesserit, pensionem", etc.; Rot. Pat., 17 Richard II, in RYMER, *Federa*; DALLAWAY, *Discourses*, 8vo., 1833, p. 376, calls him "an architect of celebrity". 19.

WALTON (WALERO of), freemason, with Edmund Byce, "civi. et jrmonger London," ordered to take "lathomos, carpentarios", and other workmen for the works at the house of John de Bethlehem at Shene; 1416 patent 4th Henry V; RYMER *Federa*, Synopsis at end of xvii; No. 4601, p. 180.

WAMBOGLEM (LOUIS); see BOGLEM (LOYS VAN).

WAN. See VAN, in Asiatic Turkey.

WANDEMBOR (JUAN), of Flanders, commenced 1725 the fabrica de tabaco, at Seville, 662 ft. by 524 ft.; it was carried on by V. Acero, J. V. Catalan, and completed 1757 by Vengoechea. 66.

WANDRUSCHKA (ALOIS), *baubeamten*, with Joseph Markl, 1828-35 built under *bau-directions adjuneten* Glogowsky, the fine *rath haus* at Lemberg; the tower is 42 klatters or about 261 ft. Engl. high. 26.

WANE. A term used in Scotland, for a habitation or dwelling. The plural *wanys* is used not as denoting different habitations, but different apartments in the same habitation.

WANEY. See WAINNY.

WANGELHEIM (... von), the master at Berlin, *cir.* 1735 of H. G. W. baron von Knobelsdorf.

WANVITELLI (LUIGI). See VANVITELLI (L.).

WARA. A term used in Domesday Book, meaning the right of pasture over uncultivated land, or common appurtenant, or commonry or intercommonry rights in one manor attached to land in another manor. In later times, *wara*, or *waredu*, meant one third or one half of the land in a manor lying fallow in any one year. CAMBRIDGE ANTIQUARIAN SOCIETY, *Proceedings*, October 1884. R. R. R.

WARD of a hospital and workhouse; casual ward; lying-in ward; vagrant ward; reception ward. SLEEPING ROOM. Those at Marylebone workhouse for the aged and infirm 1868, are 40 ft. wide, 60 ft. long, and 13 ft. high, giving 780 cubic feet for each person; being divided down the middle by a partition 5 ft. 6 ins. high; fresh air is warmed by hot water under the head of each bed, foul air is carried off by channels in the ceilings communicating with large flues up the side walls. The walls are plastered over a cement dado and coloured. SNELL, *Charitable and Parochial Establishments*, fol., 1881. The quantity of cubic feet to be or is allowed for each person, is given in GWILT, *Encycl.*, edit. 1888. The subject of "rectangular" and "circular" wards has been much discussed of late years.

The circular ward for a hospital is exhibited in the first one erected in England, the Miller Memorial hospital at Greenwich, by K. D. Young and H. Hall; the Hastings, S. Leonard's, and East Sussex, at Hastings; (*BUILDER Journal*, 1887, xxix, and *BRITISH ARCHITECT Journal*, 28 January 1887); the Burnley hospital; that at Hampstead; and those for the army; Antwerp is mentioned as possessing one. P. G. SMITH, *Notes on modern hospital construction*, 8vo., 1888.

WARD of a lock; see LOCK. Of a key; see BIT.

WARD (...), designed and built 1818 the new lodgings for students on the north side of Botany Bay court of Trinity college, Dublin, cost £26,000, piles of 20 ft. in length were used; WHITELOW, *Dublin*, 4to., Dublin, 1818, p. 1150.

WARD (THOMAS), 1430 with other *cementario* were engaged on a vaulted roof in the chamber of Charity at the cathedral of Durham; SURTEES SOCIETY, *Hist. Script. Tres.*, 8vo., Newcastle, 1839, ccccxlii.

WARDE (ROGER), mason, 13 June 1556 wrote from Burleigh to sir W. Cecil, desiring instructions as to the "building of three lucan windows for the inner court, and for the stairs from the base court to the terrace, and for the gate at the end of the terrace": the best stone for stairs is to be had at Clyps-ham. STATE PAPERS, *Domestic Series*, 8vo., 1856, p. 84. GOTCH, *Ren. Arch.*, in *Northamptonshire*, in *ROY. INST. OF BRIT. ARCHITECTS*, 1889-90.

WARDEN. A caretaker. The office as applied to a religious building appears as early as Feby. 17, 1478, in the will of John Derby, alderman, who left to the rector of S. Dionis Backchurch "et custodibus bonorum et ornamentorum" of the church; NOTES AND QUERIES *Journal*, 1881, 6th ser., iii, 207, 370. CAMBRIDGE CAMDEN SOCIETY, *A few words to Church-wardens*, 8vo., Cambr., 1841. KEEPER.

The master mason had under him one or more wardens, who exercised control over the workmen, and at large works usually succeeded to the office of master mason. The following instances comprise some specially named. 1395 W. Waldon, at Westminster hall. 1512-7 T. Watlington, W. of carpenters at Christ Church college, Oxford. 1513 Henry Semerke, King's College Chapel, Cambridge. Warden of the works 42 Henry III (1257-8) occurs at S. Martin's-le-Grand; DEVONS, *Issues*, 4to., 1837, p. 39.

The "wardens of craft" on taking office in the guild or company made oath that they would keep all "its good rules sparing no man for favour, nor greiving noo person for hate". The numbers of wardens vary from two to four.

WARDOUR QUARRY; Vale of. A freestone comprising the Tisbury and Chilmark stones. Geologically it is the same with the Portland and Purbeck series of the upper oolites. It varies in texture and is suitable for all building purposes. *BUILDING NEWS Journal*, 1869, xvi, 335, 363.

WARDROBE (Lat. *garderoba*; Fr. *garderobe*; but not in sense of *garderobe d'aisance*, a privy). A place where the garments of kings and princes and other grandees were kept in XIV and XV cent. (TURNER AND PARKER, *Domestic Arch.*, 8vo., Oxford, 1850-54). The person appointed to keep the inventory of all such things appertaining to the office was called "clerk of the king's (or other) wardrobe". A "wardrobe" existed in London, at a house near Puddle Wharf, Blackfriars, built before 1359, sold to king Edward III and converted into the repository for the royal clothes. After 1666 the wardrobe was removed to the Savoy palace and then to Buckingham street; the last master of the wardrobe died 1709; WHEATLEY, *London, Past and Present*, 8vo., 1891, iii, 448.

In XIV cent. "the wardrobe had become more established; it was generally on the ground-floor, and sometimes took the place of the cellar beyond the dais. In large establishments there were several wardrobes; the storage of clothing, dress, furnishings, leather beds, and so forth, requiring considerable space; lofts may have been used for this purpose"; KERR, *Gentleman's House*, 8vo., 1871, 3rd edit., 21, 30, and 39. In the xv cent. the

garderobe appears to have been a wardrobe, and also "on voit tout autour de la pièce, des armoires et tahuts destinés à renfermer les vêtements, les armes, les bijoux, des provisions d'étoffes. Au centre, une table basse pour les tailleurs, les couseuses," etc.: VIOLETT-LE-DUC, *Dict. du Mobilier Français*, 8vo., Paris, 1858, pt. 1 Meubles, pl. xvi, p. 362. At the château de Pierrefonds, "il reste des traces de ces garderoches boisées et garnies de tablettes." About 1527 the château de Madrid, near Paris, shows the great space allotted to the wardrobes, for no man was esteemed rich, especially amongst those who followed the court of François I, if he had not from twenty-five to thirty suits of clothes so that he might change every day; PATTISON, *Renaissance of Art in France*, 8vo., 1879, i, 63.

Among the printed collections are the following:—*Wardrobe Accounts* of Edward I and II; 10th, 11th, and 14th years of Edward II (1316-31); Edward III; Henry VI; Henry VIII, and of Henry prince of Wales, son of James I, are partly given in the *ARCHÆOLOGIA*, Index of 1889. SCOTIA; 1488-1606, *Collection of Inventories and other Records of the Royal Wardrobe and Jewel House*, 4to., Edin., 1815, edit. by T. Thomson. There are others published; also the numerous *Household Books*, *Privy Purse Expenses*, and *Inventories*.

WARDROBE ROOM. This in a "gentleman's house" may be either a small room, a closet, or a lobby, containing large presses; sometimes a fireplace may be serviceable, if not warmed by a hot-water system. Sometimes a lady maid's room will be required to serve for this purpose, with the usual presses. KERR, *Gentleman's House*, 8vo., 1871, 3rd edit., p. 39, 139, 145, 251.

WARE. A north country term; to lay out labour, money, etc.; HALLIWELL. It is still used in Yorkshire.

WARE (ISAAC). The story of this architect having been a thin sickly boy, a chimney sweeper, seen drawing with chalk the front of Whitehall, is related by J. T. SMITH, *Nollekens and his Times*, 8vo., 1828, ii, 206; and THE AMBULATOR, *London and its Environs*, 8vo., 1811, 11th edition, 283, at which time he found a patron, who educated him, sent him to Italy, and on his return employed him as an architect. This patron may have been the earl of Burlington, and Ware thus brought to the knowledge of W. Kent and T. Ripley, for his name is in the list of subscribers to KENT, *Designs of Inigo Jones*, fol., 1727. On 1728, Oct. 4, he was appointed clerk of the works at the Tower of London; 14 Oct. 1729 at Windsor castle; 1735 draughtsman and clerk itinerant to H.M. Board of Works; 1736 made secretary (succeeded by sir W. Robinson); 1736 draughtsman to the Board at Windsor and Greenwich, in place of N. Hawksmoor deceased; and 1738 while still secretary was appointed clerk of the works to H.M. palace, in room of H. Flitcroft promoted; 1741 to 1748 and perhaps later he was also purveyor. He published with RIPLEY AND KENT, *Houghton Hall, Suffolk*, for sir R. Walpole, with chimney-pieces and ceilings, fol., 1735; 1760. With Harris and Fourdrinier he engraved the plates of *Rookby, Yorkshire*, for sir Thos. Robinson, bart., fol., 1735. Also *Designs of I. Jones and others*, for chimney-pieces, staircases, etc., 8vo., 53 pl., 1735; 1743; 1756. *The Complete Body of Architecture*, fol. (1735?), 1756, 1760, 1767, 1768, giving plates of Chesterfield house, Ashburnham house, etc.; twenty-five subjects were borrowed by LANGLEY 1736; and HOPPUS twenty-two subjects for his *Palladio*; the original drawings for this *Body* are in sir John Soane's museum. *Design for the Mansion House, London*, engraved 1737. Translated *The Architecture of Palladio*, 200 pl., fol., 1738. Translated SIRRIGATTI, *Practice of Perspective* (fol., 1596, 1625), 43 pl., fol., 1756; and published Dr. B. Taylor's *method of Perspective*, by J. J. Kirby, 4to. (1766).

His architectural works comprise 1733 the conversion of Lanesborough house for an infirmary as S. George's hospital, Hyde park (print in British Museum). 1749 Chesterfield house, May Fair, for Philip, fourth earl of Chesterfield (WOOLFE, i, pl. 69-72), the columns and stairs came from Canons. 1750

cir. at Clicksand priory, Bedfordshire, the south and east fronts altered or rebuilt (before the works of J. Wyatt), NEALE, *Seats*, 4to, 1829, 2 Ser., v; ASSOCIATED SOCIETIES, *Reports and Papers*, 1866, p. 329-53 (333). 1754 the town hall and market at Oxford; the latter taken down 1774 and rebuilt by J. Gwynn; (plate in British Museum). About 1754 Wrotham park, near Mims, Bedfordshire, for admiral Byng, the wings were added about 1810 (WOOLFE, ii, pl. 46). 1759 Lindsay house, Lincoln's Inn Fields (or an alcove, for the Shiffrer family), is attributed to Ware, by A. Marks, in *BUILDER Journal*, 1882, xlii, 27. He probably designed No. 13 on south side of Hart street, Bloomsbury, the first house west of Bury place. 1760 submitted two designs for Blackfriars bridge, which were among the eleven first selected designs.

About 1749 he built a house on his property, Westbourne place, Harrow road, "erected with materials brought from lord Chesterfield's (LYSONS, *Environ*, 4to, 1795, iii, 330; *BUILDER Journal*, 1844, ii, 409), which property was eventually purchased by S. P. Cockerell who was living there cir. 1796. He also lived at Fognal hall, west end of Hampstead church (PARK, *Topography*, 8vo, 1818, p. 341); and built No. 6 Bloomsbury square, on west side next the house at corner of Hart street, which No. 6 was afterwards occupied by Mr. D'Israeli; and where Ware died 5 January 1766, while holding the offices of secretary, clerk of works, and clerk itinerant. PARK, 341, states he died at Kensington Gravel Pits in depressed circumstances. His portrait from a bust by Roubiliac was published 1st Dec. 1802. In 1763 he was master of the Carpenters' Company, London; POCOCK, *History*, 8vo., 1887. WOOLFE AND GANDON, *Vitruvius Britannicus*, fol., 1767-71. *Society for Photographing Relics of Old London*, Nos. 61 to 67, 1882. THORNBURY, in *Belgravia* magazine for May 1867, p. 329. WHEATLEY, *London, Past and Present*, 8vo., 1891. 11.

WARE (SAMUEL), born 1781, was "architect to many excellent buildings in Ireland, the splendid alterations at Chatsworth, 1824 at Northumberland house, London; and other places for the dukes of Devonshire and Northumberland" (ELMES, *Metropolitan Improvements*, 4to, 1827, i, 141), giving a view of the Burlington arcade, Piccadilly, 750 ft. long, having seventy shops, designed by him, 1815 or 1819, at which time he was effecting considerable alterations to the interior of Burlington house, for lord George Cavendish (CUNNINGHAM, *Handbook*, 8vo., 1850, p. 90). He also designed the stabling in rear of Harcourt house, Cavendish square, for the duke of Portland. He published *Remarks on Theatres, and on the propriety of vaulting them with brick and stone; on the construction of Domes, and Vaults*, 8vo., 1809; 1822. *Treatise of the properties of Arches, and their abutment piers, etc.*;—also concerning bridges and flying buttresses, 8vo., 1809. *On forms and comparison of respective merits of Vaults*, in the *ARCHÆOLOGIA*, 1812, xvii, 40; *On the origin of features in Decorative Architecture*, *idem*, 1817, xviii, 336; and *On Celts found at Postlingford, Suffolk*, *idem*, 1846, xxxi, 497. *Tracts on Vaults and Bridges*; containing observations on the various forms of vaults; rebuilding London Bridge; principles of arches; tables of bridges; pendant bridges, the properties of the catenary, etc., 8vo., 1822. He was elected a fellow of the Society of Antiquaries on March 28th, 1816; retired from practice about 1840, his office being carried on by his nephew C. N. Cumberlege-Ware; and died December 1860. *BUILDER Journal*, xii, 559; xiii, 495.

WAREHOUSE or MAGAZINE (Ind. Godown). A building erected for the storing of goods. The construction depends upon the use to which the building is to be applied; as storehouse, wine vaults, granary. The bonded warehouse is a customs regulation by which articles of import may be lodged in a public warehouse at a moderate rent, not being chargeable with duty until taken out of bond for home consumption, and being exempt from duty if re-exported. It is also applied to a place where goods are stocked for the wholesale trade; such as are described

as "Manchester warehouses" in London and elsewhere. The great fire in the Tooley street warehouses, *BUILDER Journal*, 1861, xix, 438, 486, 527, 579. DEMPSEY, *Stations, Warehouses, Workshops, etc.*, 4to., 1856. ROBERTSON, *A Model Warehouse*, in MANCHESTER STATISTICAL SOCIETY, *Transactions*, 8vo., 1859-60, p. 42; and *BUILDER Journal*, 1860, xviii, 459, 521, which describes the transmutation of dwelling-houses into warehouses at Manchester, as from 1804. OGDEN, *Studies in Mercantile Architecture, Warehouses, etc.*, fol., 1876. FRIEDMANN, *Designs for Warehouses, Markets, and Sheds*, translated by d'Avigdor, London, 1877. *Report of Select Committee on Fire Protection*, 1867, p. 195 and 471, re isolation of warehouses. Hull dock warehouses and sheds (i, 7, 21); Marseilles dock (xxiv, 150; 176, 183); West India, and Victoria, docks (xli, 121), are described in INST. OF CIVIL ENGINEERS, *Proceedings*.

Iron floors to warehouse in Corporation street, Belfast, CIVIL ENGINEER, ETC., *Journal*, 1854, xvii, 213. Strength of, at Liverpool; *BUILDER Journal*, 1869, xxvii, 89. FLOOR; fireproof.

WARING (JOHN BURLEY), born 1823, was 1840 articled to H. E. Kendall, jun.; 1843 visited Italy; on his return entered the offices of A. Poynter, ... Laing of Birkenhead, S. Smirke, R.A., D. Mocatta; visited Spain and Italy; published with MACQUOID, *Examples of Architectural Art in Italy and Spain, chiefly in the XIII and XIV cent.*, 63 pl., fol., 1850; and at the same time, *Thirty Designs adapted for Civic Architecture*, 16 pl., 4to., 1850; 1850-51 studied under Couture at Paris; again to Spain where he prepared the materials for his work *Architecture, Sculpt., and Pict. Studies in Burgos and Miraflores*, fol., 42 pl., 1852; and became connected with sir M. D. WYATT for the *Handbooks* to the Byzantine, Italian, Mediaeval, and Renaissance Courts at the Crystal Palace, 8vo., 1854. In 1856 he was appointed superintendent of the Art Works at the Manchester exhibition; and wrote *Handbook to the Museum of Ornamental Art at Manchester* 8vo., 1857. He published the fine work, *The Arts connected with Architecture; Central Italy, XIII to XVII cent.*, 41 col. pl., fol., 1858; and was appointed 1861 superintendent of the architectural gallery of the 1862 exhibition in London. With A. W. FRANKS he wrote *Glass and Enamel*, 17 pl., fol., 1861, in "Art Treasures of the United Kingdom"; edited *Masterpieces of Art in the International Exhibition*, fol., 1862; published *Illustrations of Architecture and Ornament*, 70 pl., fol., 1865; *Catalogue of Drawings from Ancient Glass Paintings by C. Winston*, 8vo., 1865; was appointed 1867-8 superintendent of the architectural gallery at the exhibition at Leeds; published *Stone Monuments, Tumuli, and Ornament of Remote Ages; early Arch. of Ireland and Scotland*, 108 pl., fol., 1870; also *Ceramic Art in Remote Ages; Symbols, etc.*, 55 pl., 4to., 1874; and *A Record of my Artistic Life*, 8vo., 1873. He died 23rd March 1875, aged fifty-two, at Hastings. *BUILDING News Journal*, 1873, xxv, 591; xxviii, 372. *BUILDER Journal*, xxxiii, 290. He contributed at the Royal Institute of British Architects, *Arts connected with Arch. in Tuscany*, 16 Nov. 1857; *Notes on Romanesque Art in South of France*, 4 March 1861; and *On Laying out of Cities*, 31 March 1873. Also *Architectural Propositions* in the *BUILDER Journal*, 1849, vii, 590; *Lineal Expression and Architectural Design*, *idem*, 1850, viii, 339 *et seq.*, 518; *Notes of an Architect in Spain, idem*, 1852, x, 180 *et seq.*; and *Critical Notes on the Great Italian Architects*, to the *BUILDING News Journal*, xxii, 1872, p. 3 *et seq.*

WARKA, Werka, Wurka, in Mesopotamia. The Erech, or UR, or Orchoe, of the Chaldees, situated south of Babylon, on the river Euphrates. Thousands of coffins have been found. "It is a complete mine for extraordinary and unheard of modes of decoration in architecture," LOFTUS, p. 190. A wall was built of mud-brick and three rows of conical vases, mouths outwards, and this order was repeated thrice—the vases vary in size from 10 ins. to 15 ins. in length, and about 4 ins. diam. at the mouth, and are only 6 ins. deep, and very thick throughout; (*BUILDER Journal*, 1863, xxi, 820). LOFTUS, *Travels, etc.*, in *Chaldea and Susiana; excavations at Warka and Shilsh*, 8vo.,

1857. BONOMI, *Nineveh and its Discoveries*, 8vo. (1852), p. 40, 377. LAYARD, *Discoveries in Nineveh, etc.*, 8vo., 1853, and 1867. ASSYRIAN EXPLORATION FUND, *Report for 1854*. ARCHÆOLOGIA, 1871, xliii, 305. BIRCH, *Ancient Pottery*, 8vo., 1873, i, 151. G. SMITH, *Assyrian Discoveries*, 8vo., 1875, p. 206. DIEULAFOY, *L'Art antique de la Perse*, fol., Paris, 1884-90. PERROT ET CHIEPIEZ, *Histoire de l'Art dans l'Antiquité Assyrie*, 8vo., Paris, 1884, ii. SPIERS, *Sassanian Architecture*, read at ROY. INST. OF BRIT. ARCHITECTS, *Journal*, 4 Dec. 1890, p. 65.

WARMING, HEATING, and VENTILATING. These subjects are usually considered together. The general history of the means of obtaining artificial warmth is given in the *Detached Essay*, HEAT, 1851, with a list of publications, which with later ones are now included herein, and arranged chronologically.

COOK, *W. rooms by Steam*, in PHIL. TRANS., 1745, p. 370. BUCHANAN, *W. Mills, etc., by Steam*, 1807. CHABANNES, *Conducting Air by forced V. and regulating Temperature of Buildings*, 8vo., 1818. SYLVESTER, *Mode of W., Vent., etc.*, 4to., Nott., 1819. TREGGOLD and BRAMAH, *Principles of W. and V. Public Buildings*, 8vo., 1824; 1836. STUART (i.e., Mickleham), *Principles, etc., of Heating and V. Buildings*, by an Engineer, 1825, 8vo., 1828. BOYCE, *Systems of W. and Vent. Buildings*, 8vo., 1826. DEWHURST, *W. Dwelling Houses and Public Buildings by Hot Water*, 12mo., 1832. COMBE, *Principles of W. and V.*, 8vo., 3rd edit. WHITWELL, *W. and V. by means of Attenuated Air*, 4to., 1834. BERNHARDT, *W. and Airing Buildings*, 8vo., 1835. INMAN, *Vent., W., and Transmission of Sound*, 8vo., 1836. RICHARDSON, *W. and V. Buildings*, 8vo., 1837; 1839. WALKER, *Merits of various systems of W. by Hot Water*, 1837. HOOD, *W. Buildings by Hot Water*, 8vo., 1837, 1844, 1850, 3rd edit. ARNOTT, *W. and V., etc.*, 8vo., 1838. PERKINS, *Patent App. for W. and V. Buildings*, 12mo., 1840 and 1841. DAVIES AND RYDER, *W. Buildings by Hot Water*, 8vo., Manch., 1841. BERNAN, *History of W. and V. Houses, etc.*, 8vo., 1846. LLOYD, *W., V., and Humidity of Rooms*, 1854. BIGGE, *W. of Churches*, *Builder Journal*, 1853, xi, 787; and 8vo., 1854. CIVIL ENGINEER, *etc.*, *Journal*, 1855, xviii, 105. *Report to the General Board of Health by the comrs. appointed to enquire into the "Warming and Ventilating of Dwellings"*, House of Commons, 1857, 309. COLYER, *Public Institutions; their Engineering and other Appliances*, 8vo., 1890: and *Treatise on Water Supply, etc., to Residences*, 8vo., 1889. BALDWIN, *Hot Water Heating and Fitting*, 8vo., 1890.

Among the books on special points are the following: JENN, *W. and V. Pentonville Prison*, 8vo., 1844. RICHARDSON, the British Museum, and Justiciary Court, Edinburgh. SYLVESTER, Derbyshire infirmary, URE, Reform Club house. New Wigan infirmary, in *BUILDING NEWS Journal*, 1870, xviii, 200. Cotton factory, in URE, *Dictionary of Arts, etc.*, 8vo., 1853, 4th edit., i, 505. Churches, in *ECCLÉSIOLOGIST Journal*, 1844, iii, 135; 1846, vi, 177; revd. H. J. Bigge, 1854, xv, 47-52. Also CHURCH BUILDER *Journal*, 1864, p. 92, 167; 1865, p. 84, 119. Houses; STENT, Fair Oak house, Isle of Wight, in *BUILDER Journal*, 1860, xviii, 330; which 1861, xix, 202, gives a useful *Table* of relative dimensions of the parts of a hot water apparatus for warming from 50,000 to 100,000 cubic ft. of air. FLETCHER, Letter to the *Times* newspaper, giving details of the apparatus used by him; also in *ARCHITECT Journal*, 6 January 1888. The system in vogue in America is described by GASS, *Some American Methods*, in ROY. INST. OF BRITISH ARCHITECTS, *Transactions*, 4to., 1886.

The danger arising from overheated pipes is referred to *s. v.* IGNITION. PAPWORTH, *Notes on the Causes of Fires, or which is the safest of the various modes of W. buildings*, 12mo., 1853. DRYING CLOSET. FIREPLACE. GAS. RADIATION. REFLECTION. SMOKE FLUE. STEAM. STOVE. STOVE GRATE. HOT WATER, by PERKINS' hot-water apparatus, i.e., HIGH PRESSURE or temperature, or the "small bore" system; and by LOW PRESSURE or temperature, or large pipe system. An explanation of each is afforded in *BUILDING NEWS Journal*, 1877, xxxii, 605. HOT

AIR; the systems of Price and Manby (CIVIL ENGINEER, *etc.*, *Journal*, 1838, i, 237, 380); of Polmaise; of Grundy; of Shorland; Snell; Galton; and other hot-air stoves.

WARONCHIN of S. Petersburg. See VORONIKHIN.

WARP. The longitudinal threads in weaving; WEFT are the transverse threads.

WARPED. Cast or bent, as applied to bricks, tiles, or pottery in burning; and to timber.

WARPING. (Fr. *déjetter*). A term applied to boards so affected by not being well dried, or by standing in the sun, or too near heat. CASTING. WINDING. When timber is cut down and exposed to the atmosphere, the moisture of the sap evaporates, causing the contraction of the porous fibres, and this is known as shrinkage or warping. Upon drying, either by natural evaporation or by artificial heat, all the green fibres and those with any internal moisture, collapse transversely and contract, but the medullary rays being arranged at right angles to the longitudinal fibres resist contraction in the direction of their length, and thus in the whole trunk produce splitting. For soundness in drying, all trunks should be promptly divided before splitting can have set in; if squared before drying, they will no longer be so after shrinkage. *Building and Engineering Times*, 4to., 1881, Feb. and March. HOLTZAPFEL, *Catalogue of Woods*, 8vo., 1843, p. 47.

The term used in Scotland for thin horizontal scantlings in brick partitions; serving as bond, equalizing pressure, and receiving battening, projecting sufficiently to allow the battens for lath to clear the rough mortar-joints. It is also used in the north of England for a brace, as "angle warplings" in LOUDON, *Encyc. of Cottage, etc., Architecture*, 8vo., 1833, § 1070.

"Warping, paring and burning, and clearing of surface incumbrances"; the first being what takes place in nature where land is covered by muddy water, either on the sea shore or on the banks of rivers; it is of great use and is successfully practised in Lincolnshire"; LOUDON, *Country Residences*, 4to., 1806, i, 225. OLDHAM, *Reclaiming Land from Seas and Estuaries*, in INST. OF CIVIL ENGINEERS, *Proceedings*, 1862, xxi, 454; and paper by PATON, xxi, 426. GRANTHAM, *Land reclaimed from the Sea*, in SURVEYORS' INSTITUTION, *Transactions*, 1883, xv, 296; and paper by WOOLLEY, x, 37. 14.

WARREN (HUGH), was April 23, 1715, appointed clerk of the works at Chelsea hospital, until 1728.

WARREN. A free warren is a franchise which gives a right to have and keep certain wild beasts and fowls called game, within the precincts of a manor, or any other place of known extent, whereby the owner of the franchise has a property in the game and a right to exclude all other persons from hunting or taking it. A warren may be open and there is no necessity of enclosing it, as there is of a park. The beasts of warren appear to be only hares and rabbits; and the fowls of warren are partridges and pheasants, though some add quails, woodcocks, and waterfowl. The franchise of free warren has nearly fallen into disuse since the enactments of modern statutes in respect to game. At Alcobaca monastery is a rabbit warren, 200 ft. long and 125 ft. wide, enclosed with walls about 16 ft. high; the floor paved with flagging, the joints filled with cement; small sheds are ranged along the foot of the wall where oval earthen pots are placed of 11 ins. depth by 9 ins. high. The front of each has a round tube through which the doe enters and here breeds. On the area are several other ranges of pots apparently set apart for the males. There were about 5,000 or 6,000; fed with plants supplied from adjoining gardens and the offals of the convent; MURPHY, *Travels in Portugal*, 4to., 1795, p. 98-9.

WARREN GIRDER. A compound, or trussed girder invented by capt. Warren, which has undergone many changes. It is distinguished from the LATTICE type, by having only one series of triangles in the web or side. The first girders had the compressive bars / \ made of cast iron, but on the failures they were made of wrought iron. The angle of the sloping

bars is 60°, and the bars are united to the flanges by pins instead of rivets. GIRDER BRIDGE, *compound*. "The Warren girder was decidedly superior to the lattice bridge"; RENDEL at INST. OF CIVIL ENGINEERS, *Proceedings*, 1852, xi, 14. The principle has been elaborately worked out by C. H. Wild; INST. OF CIVIL ENGINEERS, *Proceedings*, 1854-5, xiv, 444, 447. *Illustrations*, 1861, s.v. Girder, pt. 2. Across the Minorities, SURVEYOR, ENGINEER, ETC., *Journal*, 4to., 1842, iii, 160. Over Joiner street for the South Eastern railway, 41 ft. 6 ins. span, failed 19 October 1850; description in CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 390-1; and BUILDER *Journal*, viii, 508. Leopold railway over the river Arno, by R. Stephenson; DEMPSEY, *Iron Applied to Railway Structures*, 4to., 1850, p. 41. Newark dyke bridge; INST. OF CIVIL ENGINEERS, *Proceedings*, 1853, xii, 601; BUILDER *Journal*, xi, 361; 1857, xv, 422b. Over the river Sursuttee in East India, 83 ft. span; ILLUSTRATED LONDON NEWS, 1853, xxiii, 464. Stone viaduct across the river Bahrun on the Scinde railway, 1,728 ft. long; six viaducts of iron, 80 ft. span each, total number being 42; INST. OF CIVIL ENGINEERS, 14 April 1863, xxii, 451; ARTIZAN *Journal*, 1859, pl. 136, p. 3. CARGILL, *On Strains on Bridge Girders, Warren, etc.*, 8vo., 1873. Some do not speak favourably of these girders, when contrasted with the plate girder, as there was an amount of vibration, both laterally and vertically, caused by passing trains, which had the effect of breaking or loosening the bolts fixing the longitudinal timber stringers to the cross girders.

Warren and Kennard's patent triangular girder; HUMBER, *Treatise on Cast and Wrought Iron Bridge Construction*, fol., 2 vols., 1861, p. 54; 3rd edit., 1870.

WAISZAWA (Polish; It. *Varsavia*; Fr. *Varsovie*; Ger. *Warschau*; Engl. *Warsaw*). The capital of Mazovia until 1526, combining Polish Cracow from XVII cent., and Lithuanian Vilna, and of Poland from about 1550, and since 1831 of Russian Poland, situated on the river Vistula, crossed by the Alexandrovsk iron bridge, 1,890 feet long on six trusses, by Kerbedy, Polish general of engineers, communicating with the suburb Praga; and a railway bridge 1865, 1,710 feet long, commanded by the guns of the new citadel. In the old town is the *zamek* or castle of the former dukes (from IX century) of Mazovia, a huge Italian pile, modernised *cir.* 1550 by G. D. Scamozzi, restored for Augustus III of Saxony (1734-63), and embellished by D. Merlini for Stanislaus II Aug. Poniatowski (1764-95); in 1816 Kubicki added a new façade. The vast citadel was erected 1832-35 by the Russians at the expense of the town; in it is a Russian church, large barracks, etc. Great changes have taken place in the town since 1843. Near Cracow, gate is a marble column 26 ft. high with a bronze statue of Sigismund III 1643, the first monarch to inhabit the town. On the Saxon plaz is a broken obelisk 1842, of cast iron, a monument to the seven Polish officers who fell 29 Nov. 1830, designed by Corazzi (CIVIL ENGINEER, ETC., *Journal*, 1842, v, 139). A statue to S. John of Nepomuck; another (1822 or) 1830 to Copernicus in front of the university; and equestrian statue of prince Joseph Poniatowski died 1814 at Leipzig, both by Taturkinivitsch under Thorwaldsen. The style of art adopted in the buildings appears to be of a mediocre description.

Among the churches and cathedrals are 179 Catholic, six Greek, two Lutheran, and fourteen monasteries and four nunneries with their churches. The town is the see of an archbishop since 1818. The "huge" collegiate, now cathedral church, dedicated to S. John, was founded 1260, restored XVII cent., and 1835-42 by Idzkowski, *Compositions d'Architecture*, fol., Paris, 1843, pl. 4-6, views before and after restoration. BUILDER *Journal*, 1883, xlv, 547. The Russian cathedral was the former church of the college of Fratrurn Sclorum piarum, suppressed in 1832. The church of Our Lady is the most ancient sacred edifice in Warsaw, although retaining no marks of antiquity. The church of Holy Cross of the suppressed monastery of S. Lazarus, 1682-96 (Italian) by J. Bellotto (1653 by G. Beloto) for John III Sobieski, has

ARCH. PUB. SOC.

two west towers. S. Alexander 1814-30 by P. Aigner, has a dome. Of the reformed Franciscans. Of the Carmelites with monastery. Of the Carmelites, now containing the ancient archives of the crown of Poland. Of the monastery of the Bernardines (of S. Bernardo of the Zocolanti, by P. Aigner), with good cloisters. Of the Capuchins, 1683 with a large monument to king John III Sobieski, conqueror of the Turks. Of the Lutherans or protestants "fine", finished 1781 by Turkish prisoners, has a rotunda 200 ft. diameter (? circum.); dome 300 ft. high. S. Charles Borromeo was built about 1844. S. Andrew, *cir.* 1814 by P. Aigner. Grand church and house of the Scolopi, *cir.* 1780 by D. Merlini. Of the convent of the Visitandines. Of the Dominicans 1823 (Gothic) by ... Spilefski. Of the ancient Paulines and Dominicans (old Gothic). A large synagogue, one of many. In Praga—destroyed 1794 and 1831, is the parish church of the Bernardines. In Vola or Wola is the old parish church, now Russian; a new cathedral church, an exact model of it, is in the centre of the plain where in XVI, XVII, and XVIII cents. the kings of Poland were elected. The Catholic cemetery of Povonski is full of good tombs; there are also the Evangelical cemetery; and the Russian cemetery since 1831.

Of about 160 palaces of the Polish nobility some sixty have been confiscated by the Russians. The former palace of the archbishop of Gnesen and princes primate of Poland, was used by the minister of war, and now for the ministry of education. The palace of the archbishop of Warsaw. The large palace, of Casimir, XVII cent.; in 1770 was added the grand concert-room, royal library, and dining-room by D. Merlini; in 1816 it was prepared by ... Spilefski on its foundation for the university; its large library was designed *cir.* 1820 by P. Aigner, the books removed 1794 and 1832, and the university closed but reopened 1861-4. The "Saxon" palace for Augustus II on 17 acres, is now a fine pleasure garden, a summer theatre, with colonnades ending in blocks of buildings. Count Krasinski's palace (Ionic), used as courts of law, now the senate house, and used partly for government offices. Prince Radzivil, now used by the governor-general; front and wings (Corinthian) by P. Aigner, *cir.* 1823. Count Brühl, *temp.* Augustus III (1733-63) by J. F. Knebel, occupied 1815 and 1830 by the grand duke Constantine, and 1862-3 by marquis Willspolski. Others are Pod Blachoi now a chancery court (small); Pac or Pats family (fine); marquess Myszkowski and count Wielopolski now the "Resource of the merchants"; the ex-ministry of finance (Corinthian) 1822-3 by A. Corazzi with wings (Ionic) by ... Spilefski. Counts Zamojski, erected by Augustus II for his favourite daughter (sacked 1863) and now used by the subalterns of the garrison. Mostovski (old) now barracks. Princes Czartoryski now of count Potocki. Princes Oginski (old). Tarnovski with a garden. Princes Jablonovski. Tyszkiewicz now count Potocki. Mokhranovski now count Uruski. Count Radzieiowski now count Krasinski; and Ordynatskie now the conservatoire of music. Many were built or designed 1775-85 by C. F. Weinert.

The town house or hôtel de ville (burnt 1863) now police office; old mint; new mint by Lessel, finished by P. Aigner *cir.* 1820 (PENNY CYCLOPEDIA); market-place with the Zelazna Brama or "irongate" and the gostinyi dvor or bazaar; large Marieville bazaar, somewhat oval in shape with arcades, by Jacob Gay; ALLGEMEINE BAUZEITUNG, 1844, pl. 585. Exchange by P. Aigner. Large national or bank of Poland established 1828. Large hôtel de l'Europe, before 1863. Academy of Sciences, 1822-3 by A. Corazzi. School of fine arts, *cir.* 1820 by ... Spilefski. Observatory, *cir.* 1820 by P. Aigner, said to be one of the finest in Europe. Large barracks for each regiment; summer barracks for the troops; artillery barracks 1818 by Kubicki, who designed the cavalry barracks, and 1818 the riding-house (Doric). Engineer and artillery schools by ... Minder, one of the noblest buildings in Warsaw. Guard house, *cir.* 1820 by P. Aigner in imitation of "la gran guardia" at Verona. Foundling hospital, 1824, has a façade

1,000 feet long, and is the largest of six other hospitals. Of five theatres, the opera-house comprises one for the opera and also a theatre for the national drama; one theatre was designed by C. Solari *cir.* 1540; and an open-air one for the Lazienki gardens with its surroundings.

In the suburbs:—the Lazienki park and Belvedere palace 1764-80 and baths, by D. Merlini or Kamsitzer, as a summer residence for Stanislaus II Aug. Poniatowski, is now that of the governor-general (LOUDON, *Encyc. of Gardening*, 8vo., 1833; new edit. 1850, § 483. Villanov or Wilanow château, the property of countess Potocka built for John Sobieski who 1696 died there; (Italian villa with terrace and wings), completed by Stanislaus II. Two villas (*hutor*) Morysin and Natolin belong to count Potocki; the villa Ursinov and many others; Krolikarnia, Vierzbus, Mokotov, Garenne for count Tomatis of Turin, later of prince Radzivil, was *cir.* 1780 by D. Merlini; the castle or villa Jablonna by D. Merlini; the Marymount for the wife of John Sobieski; the Kaskada; and the Saska Kempa, are other noted places. Modlin, now NOVOGORODIEVSK, is about twelve miles below Warsaw, it was fortified by Napoleon, taken 1813 by the Russians, and the last Polish stronghold in 1831.

Map No. 212 of the Society for the Diffusion of Useful Knowledge, fol., 1835 (?); 1872, which gives elevations of all the chief buildings in little. CHAPPE D'AUTEROCHE, *Voyage en Sibérie*, 1761, 4to. and fol., Paris, 1768, i. CIAMPI, *Viaggio in Polonia*, 8vo., Fir., 1831. CANNABICH, 1836. FORSTER, in L'UNIVERS PITTORESQUE, 8vo., Paris, 1840. *Album des Vues de W.*, etc., 4to., Warsaw, 1861 (?). ENCYCLOPEDIA BRITANNICA, 9th edit., 4to., 1888. 14. 28. 50. 96.

WARYN (W...), at Eton college. See LYNDE (W.).

WASH. All old work requires to be well washed to get off grease and dirt before the new material is applied, hence the insertion of the term in specifications especially for ceiling or painted work. DISTEMPER. LIMESWHITE. WHITEWASH. PAPERHANGING, which has of late years been manufactured to be cleansed, as Lee & Co.'s "patent oleocharta waterproof washable paperhangings"; also Heywood & Co.'s "sanitary washable paperhangings", 1885. KALSOMINE. "Duresco" is "a non-poisonous washable distemper"; as is Morse's improved patent "Calcarium", which are among the many modern inventions. Bell's asbestos Aquol paint is stated to be washable.

WASH BOARD. See WEATHER BOARD.

WASHBOURNE (RICHARD), mason 1395 at Westminster hall; see SWALVE or Swallow (J.). 19.

WASHED OUT. The term in Kent for a piece of underwood marked out for cutting. BLAZED.

WASHER (Fr. *rondelle*). When a bolt is passed through two surfaces of iron the head and nut are generally sufficient of themselves, but when applied to timber a thin piece of iron called a "washer" is applied against the wood, to prevent the material being forced or injured in the screwing up, or when subjected to strains. It is also the perforated metal plate covering the waste or bell trap in a sink, and is usually movable to allow of the trap being cleaned out.

WASHER AND WASTE. The waste-pipe from a cistern or washhand basin has to be connected with the basin by a short pipe to which the waste is affixed by a union with a leather or other washer to prevent leakage. Scott's new patent leather washers for union joints, high pressure water-taps and screw joints in general, for $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 inch diameters. PLUMBING and publications named therein. Washhand basins and cabinet stands are described with cuts in the article "Plumbing" in BUILDING NEWS Journal, 1873, xxv, 4: and in many Trade books. Washing bowls on pivots; wash-basin with plug and chain; washing trough; see LAVATORY of the monasteries. WATER DRAIN.

WASH-HOUSE. The small outbuilding attached to a dwelling especially in the suburbs, containing a sink and copper with table for the purpose of family washing. Sometimes it also serves for the SCULLERY. The BUILDER Journal, 1845, iii,

446, records the modification of the then Building Act for such erections; and 1863, xxi, 296, gives an article and sketch of one of the many bad specimens of wash-houses.

A wash-house forms a portion of LAUNDRY OFFICES, and on the ordinary scale for a good-sized private house will be from 20 to 30 ft. by from 15 to 20 ft.; lofty and well lighted; the floor of stone with a drain for cleansing. Flues or other openings for the escape of steam, and fresh air admitted by regulated openings. Such a building is usually removed to a distance from the house as the smell of washing travels far. The apparatus comprises one or more coppers; a dresser containing four, six, or more wash-trays having hot and cold water laid on and a waste to each; a boiler for the supply of hot water. A wringing machine, perhaps a washing machine. A good-sized table. The wash-trays placed under the windows, generally about $2\frac{1}{2}$ or 3 ft. by 18 or 24 ins. and 18 ins. deep, with sloping sides making the width at the bottom 6 ins. less; there ought to be loose standing boards provided for each washer. A cellar for fuel is necessary. KERR, *Gentleman's House*, 8vo., 1871, 3rd edition, 236. A "porcelain bath tub" is now supplied with faucet holes in its back for hot and cold water-supplies, or faucet holes in its "over top", these tubs are without covers; the former can have a cover if required.

In an Inventory of 1594 occurs "in the washhouse, tubbs 3, swills 3, soacs 3, clothbaskets 2"; ARCHÆOLOGIA, 1884, xlviii, 147, and 151; this wash-house would appear to have been used as a kitchen lumber place.

A washhouse of a public department contains the necessary washing troughs supplied with hot and cold water, and wringing machines, with access to the DRYING CLOSETS, IRONING ROOM, and mangling machine. The *Detached Essay*, BATHS AND WASH-HOUSES, 1851-52, gives details of the early buildings of this class, of which many later examples are given in the BUILDER and BUILDING NEWS Journals. BALY, B. and W., 8vo., 1852. ASHPITEL and WHICHOORD, B. and W., 8vo., 1853. CAPE, B. and W., 8vo., 1854. STREET, *Steam Laundry Buildings and Machinery*, 8vo., 1879.

Among foreign examples are the following:—At Barcelona, ten public lavatories (wash-houses only), one of these, the *lavadero de la Aduana* accommodates 800 persons at a time; while the *lavadero del Pastun* will hold 300 in each of its divisions. At Brescia, the *torre di pallade* with its fountain of 1596 is now used as a public washing place. ALLGEMEINE BAUZEITUNG gives illustrations, 1861, pl. 396-9, W. & B. in France. 1862, pl. 477, Waschanstalt des Klosters der abtei aux bois bei Versailles. 1863, pl. 552-5, W. & B. in France for six persons; in Paris for 25, and for hospitals. 1864, pl. 676-8, Wasserhebenmaschinen. The establishment at Bruxelles was published, fol., 12 pl. The NOUVELLES ANNALES DE LA CONSTRUCTION, illustrates 1855, i, pl. 31, Lavoir public de Leopoldstadt à Vienne, by L. Foerster cost 280,000 fr. 1858, pl. 9-10, Blanchisseuse économique à S. Dié (Vosges). 1858, iv, pl. 23-4 wash-tanks by continual flow of hot water from a boiler and washhouse. 1859, pl. 27, Lavoir, bain, et buanderie économique. 1860, pl. 45-6, Blanch. écon. pour 200 personnes. 1863, pl. 43-4, Bains et lavoir publics de la cité Napoléon.

FLOATING WASHHOUSES (Fr. *bateau lavoir*). On the river Seine at Paris, are a number of boats or barges which are used for laundries; the largest affords accommodation for 250 workers on two floors. In the middle is the building containing the cauldron and coppers. The upper floor is the drying ground. There is also the canteen with its dining-room, and kitchen with cooking stove. THE TEXTILE TRADE REVIEW, June 1887.

WASHING. The term used in the early days of water-colour painting, when "the design drawn with a pen or crayon, has indian ink, bistre, etc., laid over it, with a pencil, as a pale red for bricks, green for trees and meadows, saffron for gold or brass, etc., to make it appear the more natural." GAUTIER, *L'Art de Laver, ou nouvelle manière de peindre sur le papier*, 12mo., Lyon, 1687, is a very early treatise on water-colour

drawing. Also when painting in miniature, the colours are laid on flat without dotting, either on vellum or paper. 4.

WASHING OF COLOURS, is by putting such colours as red lead, verditer, blue and green bice, snail, yellow ochre, and other gritty colours, into fair water, stirring it about, and skimming the filth that flows on the surface until the colour is clear. 4.

WASHING PLACE (Fr. *Lavoir*). An arrangement in hot countries for the public washing of linen in the open air, at a public supply of water, or at a stream. At Rome; trough at the fontana de Trevi, p. 710; and aqua Vergine, p. 712; and in Via del Lavatore, pl. 274, of LETAROUILLY, *Rome Moderne*, 4to., and fol., Paris, 1840-50. Lavoir public établi sur un cours d'eau dans une commune, MONITEUR DES ARCHITECTES, 4to., Paris (1851?), vi, pl. 62, by J. A. Leveil. Lavoir public at Pargny sous Mureau (Vosges), by Abel Mahey, *idem*, xxxii, pl. 378. At Vitry sur Seine, 1842 by Molinos, in NORMAND, *Paris Moderne*, 4to., Paris, 1849, iii, pl. 80. "Fontaines, Lavoirs et Abreuvoirs", in VERDIER AND CATTOIS, *Arch. Domestique*, 4to., Paris, 1857, ii, 179. "Lavoirs," in NARJOUX, *Arch. Communale*, 4to., Paris, 1870, i, 71-7. Examples at Ronciglione, Civita Lavinia, and Velletri; pl. 80, at Mola di Gaeta, and piazza del Popolo at Rome; are given in LECLÈRE, *Recueil d'Architecture*, fol., Paris, 1826, pl. 36.

WASHING ROOM. See LAVATORY and BATHROOM for human ablution. WASH-HOUSE for washing linen.

WASHINGTON. The capital of the United States of North America, was fixed here 16th July 1790, and in 1800 the seat of government was transferred from Philadelphia, and incorporated as a city 3rd May 1802, situated in the district of Columbia, at the confluence of the rivers Anacostia or Eastern branch and the Potomac; over the latter is Long bridge for rail and passengers, about a mile long; three over the former, one for rail only; and four over Rock creek, with a chain bridge further up. The aqueduct, formerly the Chesapeake and Ohio canal, for the supply of water, has a granite arch, called Cabin John bridge, 220 ft. span and 20 ft. 4 ins. wide on the soffit, crosses a ravine 100 ft. deep, and another arch formed of two rows of pipes 50 ins. int. diam., 200 ft. span across the Rock creek, resting on stone piers; completed 1860, by capt. M. C. Meigs, whose *Report on Water Supply*, is in CIVIL ENGINEER, ETC., *Journal*, 1855, xviii, 193-8. BUILDER *Journal*, 1858, xvi, 874, from INST. OF CIVIL ENGINEERS, *Address* by J. Locke. BUILDING NEWS *Journal*, 1860, vi, 230; and 1870, xvi, 412, showing the granite arch. The city was planned by major P. C. L'Enfant, and carried out by A. Ellicott, Roberdeau, and the Kings, in fifteen avenues, each from 120 ft. to 160 ft. wide, and some miles long; two being 85 ft. wide; other streets crossing at right angles are from 70 ft. to 110 ft. wide. Many buildings were erected or rebuilt since 1871 and 1874; the city is now governed by three commissioners. The public monuments comprise an equestrian bronze figure of Jackson by Clark Mills; of Lincoln by Lot Flannery; bronze statue of gen. J. A. Rawlins by J. Bailey; to Lincoln of bronze 1876; equestrian of Washington by Clark Mills; and another to gen. Scott by H. K. Brown; a colossal sitting figure to Washington by Greenough, west of and facing the capitol; the navy monument; and the plain marble obelisk to Washington, 55 ft. square at the base and 555 feet high; the original design by R. Mills, July 4, 1848, is described in ILLUSTRATED LONDON NEWS, 1850, xvii, 32; BUILDER *Journal*, 1855, xiii, 248; from WELD, *Vacation Tour*, 8vo., 1855, p. 254, 286.

The capitol, for the sittings of Congress, was designed by Dr. W. Thornton in competition; the corner stone laid Sept. 18, 1793, by G. Washington under S. Hallet; the north wing was chiefly carried out under Geo. Hadfield, who was selected by col. Trumbull in London; opened 17 Nov. 1800, continued by J. Hoban, and succeeded by B. H. B. Latrobe, who finished the exterior, altered its interior design, added the south wing 1808-11, and designed the central portion. The interior of both wings was burnt 24 August 1814 by the British. Latrobe resigned in 1817, and was succeeded by C. Bulfinch, who March

24, 1818, erected the rotunda, improved the design of the east or principal front, and completed the edifice in 1827-8 at a cost of 2,746,718 dollars. About 1834 R. Mills materially assisted the acoustic properties of the hall of representatives. The edifice (Corinthian) built of freestone is usually kept painted white; it was 352 ft. 4 ins. long by 121 ft. 6 ins. deep, having an entrance portico on the west 160 feet long, 65 ft. wide, of 24 columns 38 ft. high (plan in CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 293). The rotunda behind is 95 ft. diam., 95 ft. high, 120 ft. outside, having 24 Corinthian columns of the variegated Potomac marble sometimes called "pudding stone", with paintings by col. John Trumbull and others, and statues. Behind or westward is the library 92 ft. by 34 ft. by 38 ft. high. In the north wing is the senate chamber, a 74 or 78 ft. semicircle and 42 or 45 ft. high, with the supreme court under it. In the south wing is the hall of representatives of same form, 96 ft. by 60 ft. high, and vaulted in brick (view of interior in PENNY MAGAZINE, 1835, iv, 397-400); and some 70 rooms for committees and other purposes. An act was passed Sept. 30, 1850, for the extension of the accommodation, and the corner stone was laid July 4, 1851, and completed 1867, by T. U. Walter with capt. Meigs (WALTER, *Report of Architect on the extension of the Capitol*, 8vo., Wash., 1864). The entirely new north and south wings of white marble, each 44 feet distant from the old capitol are each connected by a corridor 56 ft. 8 ins. wide; each wing is 142 ft. 8 ins. wide by 238 ft. 10 ins. deep. The front is now 751 ft. long; above the original dome is a large cast-iron dome 96 ft. diam. inside, 135 ft. 6 ins. outside, and 180 ft. high inside, and 287 ft. 6 ins. high outside, surmounted by a bronze statue of Liberty 19 ft. 6 ins. high by Crawford. The whole cost 13 million dollars (a view in ENCYC. BRIT., 9th edit., 1875, ii, 454). The bronze door was modelled 1858 in Rome by R. Rogers and cast at Munich 1860; it is 9 ft. wide, 17 ft. high, and weighs 20,000 lbs. (BUILDER *Journal*, 1863, xxi, 35). The new senate chamber in the north wing is 113 ft. by 80 ft. and 36 ft. high, with galleries for 1,200 persons; the hall of representatives in the new south wing is 139 ft. by 93 ft. and 36 ft. high, with a gallery for 1,000 persons. The old senate hall is now the supreme court; the court of claims is in the basement of new south wing. The old hall of representatives is now used for historical statues and paintings. A detailed description of this extension with an elevation of the new dome is given in BUILDING NEWS *Journal*, 1869, xvi, 83, 91. To the former library has been added two wings each 90 ft. 6 ins. long, 29 ft. 6 ins. wide, and 38 ft. high; the law branch is placed below the supreme court. A new library for congress is building west of the capitol. These additions are shown in FERGUSON, *History of Modern Styles*, 8vo., 1873. It may be necessary to add that the dimensions given in this article apparently describe the size of the site which each building occupies, including steps and other projections. FERGUSON states, p. 501, that his dimensions may be depended upon.

About a mile distant is the president's residence, or White house (Italian Ionic), 170 ft. by 86 ft., of Potomac freestone yearly painted white, designed 1792-1800 after a competition, by J. Hoban (burnt 1814 and restored 1815-18), and was connected in the rear with four brick houses containing the government offices. The new building for state, war, and navy, 471 ft. by 253 ft. and 128 ft. high of granite (renaissance), was erected 1871-77. The department of agriculture (renaissance) completed 1868, is 170 ft. by 61 ft. of three floors. Patent office 1841 (Roman Doric) 280 ft. by 70 ft. deep to surround a court 265 ft. by 135 ft., three stories high; a fire Sept. 1877 destroyed the fine model hall 275 ft. by 65 ft. by 30 ft. high (ALLGEMEINE BAUZEITUNG, 1859, plan, etc., pl. 237-40). Department of the interior (Doric) is 453 feet by 331 ft. and 75 ft. high around a court, of freestone, marble, and granite, cost 2,700,000 dollars. Treasury by T. U. Walter, or R. Mills, 468 ft. by 264 ft., has a colonnade 300 ft. long of 31 fluted Greek Ionic columns, some 500 rooms, and cost six million dollars. Smithsonian institution

(romanesque) by ... Renwick, finished about 1850, a centre 205 ft. by 55 ft., two ranges 60 ft. long by 47 ft. wide, east wing 45 ft. by 75 ft., and west wing 34 ft. by 65 ft.; the grounds were laid out by A. J. Downing. The Columbian college, founded 1821; Howard university; Roman catholic college at George town; school buildings by Kluss and Kammerhuber in *ALLGEMEINE BAUZEITUNG*, 1868-9, pl. 34-5. Corcoran Art gallery 1859-1861 by Renwick and Auchmuty (*DUBLIN BUILDER Journal*, iii, 554). New national museum. Post-office (Corinthian) of white marble, burnt Dec. 1836, by R. Mills 1839, 300 ft. by 204 ft. (or 204 ft. by 102 ft.) cost 1,700,000 dollars, it was extended 1855 by T. U. Walter. City hall (Greek Ionic) 1820-26 and completed 1850, 200 ft. long, by G. Hadfield. The British embassy, the handsomest and costliest residence in the city, was completed 1874; it cost about 150,000 dollars, contains 70 rooms and covers about 10,000 square feet. Arsenal of 27 acres; navy yard of 27 acres; naval observatory in George town; government printing office; artillery barracks; marine barracks; naval hospital; two orphan asylums; penitentiary; government asylum for insane, by T. U. Walter; college for deaf and dumb; bureau of engraving and printing and pension office; reform school; United States bank; soldiers' home; Ford's opera, national and other theatres; assembly rooms; botanic gardens of ten acres; and five chief markets with good buildings. There are numerous (117 in 1876) churches and chapels, among which is Trinity episcopal (Gothic).

JANSON, *Stranger in America*, 8vo., 1807 (GENTLEMAN'S MAGAZINE, 1807, lxxvii, pt. ii, 647). W. MORRIS, *Canada and the United States*, 18... J. A. PORTER, *City of Washington*, in Johns Hopkins University Studies, 3rd series, No. 11 and 12, Baltimore, 1885. DUNLAP, *Arts of Design*, 8vo., New York, 1834, i, 336. TUTTILL, *Hist. of Arch.*, etc., 8vo., Phil., 1848. ARCHITECTS AND MECHANICS' MAGAZINE, New York, before 1860. ARCHITECT *Journal*, 1850, ii, 38, 57. RIPLEY and DANA, *American Cyclopædia*, 8vo., 1876. *Art in Washington*, in CIVIL ENGINEER, ETC., *Journal*, 1854, xvii, 157; and *Notes on Acoustics and Ventilation of Halls of Congress*, by capt. M. C. Meigs. *The City of W.*, 12mo., London, 1859; *Stranger's Guide*, 24mo., New York, 1864; and *W. City and how to see it*, 8vo., New York, 1876. De B. Randolph KEIM, *Illus. Handbook; Washington and its Environs*, 6th edit., 1875. HARPER'S NEW MONTHLY MAGAZINE for March 1881. ENCYCLOPEDIA BRITANNICA, 4to., 1888. 14. 50.

WASH MILL. The machine used in brickmaking, in which the clay is cleaned of any impurities; it is described s. v. BRICK (p. 138). It is one of the three mills used, as the pug, wash, and rolling, mill. *BUILDER Journal*, 1856, xiv, 443, 454; and *BUILDING NEWS Journal*, 1874, xxvii, 333. PUGMILL.

WAS IST DAS. The same as VASISTAS.

WAST (JEAN), the same as VAAST (J.).

WASTE (Lat. *vastum*). The committing of any improper spoil or destruction in houses, lands, etc., by tenants for life or for years, to the damage of the heir or of the person entitled in reversion or remainder. Waste is either *voluntary*, which is an act of commission, or *permissive*, which is a matter of omission only. USE AND WASTE. WEAR AND TEAR. INJURY. 14.

WASTE OF MATERIAL. "Fir is dearer than elm by the foot, yet it is cheaper to use the former as there is so much waste in the latter, occasioned by the elm being in general what the workmen call very waney", WOOD, *Cottages*, 8vo., 1788, p. 12. In stonework the waste (Fr. *dechet*) is usually considered a sixth part of the details. *Inch stuff*; when measured in work a considerable allowance in price is required for waste, varying from one-seventh to one-fourth, according to the quality. Of what is technically called "clean deal", viz., without sap or knots, the listing and selection are very great; WALE, *Tables*. In mahogany, the waste is about one-tenth to one-eighth. In castings; the custom in the brass trade is to allow 7 lbs. per cwt. above that, the loss was deducted from the wages of the men. 1331, Aug. 11, 2 cwt. of Spanish iron for bars, "almost one-half of which was

wasted in the fire"; BRAYLEY AND BRITTON, *Palace of Westminster*, 8vo., 1836, p. 153 et seq. In lead work 6 lbs. per cwt. is deducted from the gross weight for dross and waste.

WASTE CHANNEL. The byelaw of the Local Government board enacts that all "waste-pipe discharges" shall empty into the open air and over a channel 18 ins. away from and leading to a trapped gully. Doulton and Co. have manufactured a "waste receiver and channel" of earthenware (Docking's patent), which is cleaner, cheaper, and better than one formed in brick and cement.

WASTE HALL. A term used by John Thorpe on his drawings for the entrance hall of a house.

WASTE-NOT REGULATOR. See WATER WASTE-NOT REGULATOR.

WASTE PIPE, or overflow pipe (Fr. *trop-plein*). This was a lead pipe, called also a stand waste-pipe, as it stood up in a cistern and having a cup top, or trumpet mouth, it allowed any overplus of water to pass down into a drain, instead of overflowing the sides of the cistern. As foul air often ascended by it into the cistern or house, it is now made compulsory by the water companies that an overflow pipe be formed from the usual surface of the water into the open air, and to be easy of inspection from outside the premises. *BUILDER Journal*, 1864, xxii, 868; *BUILDING NEWS Journal*, 1874, xxvi, 227; and *Pneumatics of the Waste-pipe*, 1876, xxxi, 609, 679. BUCHAN, *Plumbing*, 12mo., 1876, p. 88.

WASTELL (JOHN), (probably of Cambridge), 1508-9 master mason at King's College chapel, Cambridge; 1512 with H. Semerk a warden, contracted to complete the twelve severys or vaulting, to vault two porches, also seven chapels, nine other chapels, with their battlements; and 1513 "one tower with the finalls of twenty-one buttresses"; and was bound to "kepe continually lx (60) freemasons working vpon the same". Contracts or indentures in WALPOLE, *Anecdotes of Painting*, 8vo., 1862, edition by Wornum, i, 106, 481-3. BRITTON, *Arch. Antiquities*, 4to., 1807, i; and WILLIS and CLARE, *Arch. Hist.—of Cambridge*, 4to., 1886, p. 715-6 of Index. 19.

WASTING or dreeping. A term applied in Glasgow to the small space behind small-class tenements, running up between house and house. It is only from six to twelve inches wide and from it the back rooms in some houses obtain light. Some say it represents a space once occupied by a garden wall, on which neither of the adjacent owners had a right to build; others say, that the space was left that the eaves of each owner's house might drip on his own ground; and this latter explanation seems to be borne out by the common name of dreeping or wasting applied to such a cranny—making houses better no doubt at first than if they had been built back to back with no thorough draft. But when the habits of the people were dirty, and they threw things out of the windows, these dreepings being far too narrow to be cleansed in any way, became receptacles for substances carrying disease in every breath of air—; Octavia HILL, *Homes of the London Poor*, 8vo., 1875, p. 179. EAVES.

WASTING. In Scotland called "clouring". Splitting off the surplus stone from a block, with a point or a pick, reducing it to nearly a plane surface. 1.

WATCHET, Waget and Wachet. Supposed to be a pale blue colour. "Two long clothes of gold and watchet silke," 1633-4, inventory; SURTEES SOCIETY, *York Fabrick Rolls*, 8vo., Durham, 1859, p. 316. CHAUCER, edition by WRIGHT, 8vo., 1847, line 3321.

WATCH HOUSE. A building erected by the authorities for the persons employed in the due care of the locality. A good example at Paris, by F. C. Gau; *ALLGEMEINE BAUZEITUNG*, 1843, pl. 498.

WATCHING CHAMBER, or LOFT (Lat. *excubitorium*). A gallery in a church from which the monks could observe the shrine. That in S. Alban's cathedral contained in the lower part almeries for the reliquaries and presses for the vestments;

Illustrations, 1867, pt. 1; *BUILDER Journal*, 1856, xiv, 326; is of oak and has but one rival now in England, that of S. Frideswide at Oxford cathedral; KING, *Eastern Cathedrals* (Murray), 8vo., 1862, p. 22; *BUILDING NEWS Journal*, 1876, xxxi, 142; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1878, p. 125. Other examples are named, *s. v.* LOFT. WAKING RECESS.

There was also a room or hall so called in palaces, as "the king's great watching chamber", beyond the banquetting hall at Hampton Court, which was used as the guard chamber; there was also "the queen's watching chamber". The ceiling of the former room, 1536, is given in Law, *Hampton Court*, 8vo., 1885, p. 107, 180, and 365; and ii, 10; it is 62 ft. long, 29 ft. wide, and 29 ft. 6 ins. high, with a semi-circular oriel and high clear-story windows. It was Wolsey's great dining-room.

WATER. A compound substance of two volumes of hydrogen gas and one of oxygen; a protoxide of hydrogen. It is a liquid having various properties, and may be pronounced fit for domestic use when it is fresh, limpid, and free from smell; when it boils vegetables without affecting their colours; and dissolves soap without leaving curds. It should be very slightly affected by either the nitrate of baryta, the nitrate of silver, or the oxalate of ammonia, and when evaporated, the residuum should be very small. Potable water it appears is improved somewhat by the presence of carbonic acid gas: and of a certain portion of the chloride of sodium, and of carbonate of lime. *Rain water* is always soft; it so nearly approaches to absolute purity as probably to be equal to distilled water for all purposes except nicer chemical experiments; but if long kept, especially in hot climates, it acquires a strong smell, becomes full of animalculæ and in some degree putrid. **RAINFALL.** *Ice and snow water* equals rain water in purity. *Loch Katrine water* is the purest in actual use in a great city; for in 100,000 parts there are only three parts of extraneous stuff. *Spring water* will be as various in its contents as the substances that compose the soil through which it flows. Streams from a clear siliceous rock in a sandy or stony bed, are from the outset remarkably pure, as in Wales and Switzerland. Some rivers do not take their rise from a rocky soil and are indeed at first charged with foreign matter, become during a long course, even over a rich cultivated country, remarkably pure as to saline contents, but often fouled with mud, and vegetable or animal exuvie. It may be hard or soft or nearly soft. Five grains of earthy salts in a pint constitutes a hard water. *Well water* from deep wells is generally much harder than that of springs which overflow their channel, for much agitation and exposure to air produce a gradual deposition of the calcareous earth. *Distilled water.* The condensed steam of water; that of sea water easily produces fresh water of the purest kind. *River water* in general is much softer and free from earthy salts than the last. By agitation in the current and increase of temperature it loses common air and carbonic acid, and with this last much of the lime held in solution. The specific gravity becomes less and a hard spring often becomes an almost soft water river. **RAINFALL.** *Marsh water* is found by simple distillation to manifest no acid quality; it abounds with decayed vegetable matter, the most unwholesome of all substances, and when brought into contact with water and submitted to the action of the sun's heat, the most offensive. *Sea and salt water.* This variety would require no reference, but its occasional use in building operations is noticed *s. v.* SEA WATER, and SEA SAND, and OXIDATION. It was generally agreed by masons, that mortar, if mixed with salt water, would never harden in so great a degree, as the same kind of composition would do if made with fresh water. Sea sand in plaster—or in joints of the walls, will show in very damp weather, etc.: SMEATON, *Edystone Lighthouse*, fol., 1793, p. 103.

LEAD; for effects of water thereon.

Hard and soft waters. Water is usually rendered hard by ARCH. PUB. SOC.

the suspension in it of calcareous substances, which are rendered soluble by the presence of carbonic acid. Water containing earthy carbonates is usually bright, hard, pleasant to the taste and refreshing, while pure water is soft, tasteless, and affords none of that sense of exhilaration which is always associated with "the crystal spring". The French *savans*, when inquiring after water for the supply of Paris, found that more conscripts are rejected in soft water districts, on account of imperfect development and stunted growth, than in the hard; and they concluded that calcareous matter in water is essential to the formation of tissues. In these islands, it appears that the death-rate is influenced by the water-supply, not only as to its sufficiency and the amount of organic matter suspended in it, but also as to its relative hardness. Glasgow and Manchester are supplied with soft waters, and have high death-rates; Birmingham, Bristol, Newcastle, and Warwick have hard waters and low death-rates. "It may be said that in towns supplied with water of more than ten degrees of hardness, the average mortality is about 22 per 1,000; while in those supplied with softer water it is about 26 per 1,000; *Papers* of February 19th 1870. The Rivers Pollution Commissioners put the several waters derived from various sources in the following order, having regard to their hardness:—1, Rain water (softest); 2, Upland surface water; 3, Surface water from cultivated land; 4, Polluted river water; 5, Spring water; 6, Deep-well water; 7, Shallow-well water (hardest). They consider water at or below six degrees of hardness to be soft, and above that number of degrees to be hard. In 1851 the commissioners reported that it was found that the hardness of London water, as it is commonly used after boiling, was about 5°, while without heating it is 14°. The transparent water of some wells is very hard from holding a quantity of calcareous earth or its salts in solution, discernible by the addition of a few drops of solution of oxalate of ammonia, instantly rendering the water turbid by the calcareous matter forming an insoluble salt of lime: or by a solution of soap in spirits of wine, when if hard, the soap will be curdled. Water may be preserved fresh or fit to drink any length of time in barrels charred inside. A small quantity of alum in powder will clear water of ordinary impurities in a few hours. The "Spencer process" of purifying water by magnetic oxide of iron, is explained in URE, *Dictionary of Arts, etc.*, 8vo., 1875, iii, 1100; 1878, iv, 940. The late Dr. Clark's formula for softening water, as recommended by the royal commissioners of 1851 and 1868, is described in SOCIETY OF ARTS *Journal* of May 14; and in CIVIL ENGINEER, ETC., *Journal*, 1857, xx, 37-8. Also the "Atkins system" at Henley-on-Thames, in *BUILDER Journal*, 1886, li, 181, section.

1. BROUGHAM, *The Composition of Water*, printed in CIVIL ENGINEER AND ARCHITECTS *Journal*, 1839, ii, 417-9. *Water, House Supply, and Drainage*, by Wylson, in *BUILDER Journal*, 1846, iv, 313, 326, etc. BURNELL, *Water*, in *Aide Mémoire*, 8vo., London, 1852, iii. Royal Commission "on Water Supply", and Appendices, 1869 and 1870. DWYER, *Hydraulic Engineering*, 8vo., Dublin, 1847. *Water Service of Dwellings*, in *BUILDING NEWS Journal*, 1871, xx, 320. PARRY, *Water: its composition, collection, and distribution*, 1881. FRANKLAND, *Water Analysis for Sanitary Purposes*, 8vo., 1880. WANKLYN AND CHAPMAN, *Water Analysis*, 8vo., 5th edit., 1879. C. FOX, *Sanitary Examinations of Water, Air, and Food*, 8vo., 1879; and his *Water Analysis*, 8vo., 1875, 2nd edit. WYNTER BLYTH, *Manual of Public Health*, 8vo., 1890.

A cubic inch of distilled water at 62° Fahr. and 30 ins. barometric pressure weighs 352.458 (or .72) grs. and is rather more than 815 times heavier than an equal volume of air. A cubic foot = 62.3862 lbs. avoird.; or 62.3206 lbs.; (also 62.3210); or 6.2321 galls., or nearly 6½ gallons. A cubic inch weighs .0361 lbs.

An ounce of water = 1.73298 cubic ins.

Imperial gallon = 277.296 cubic ins., or 10 lbs.

Standard avoirdupois pound = 7,000 grs. troy.

Standard troy pound = 5,860 grs. troy.
 " gallon = 10 lbs. avoird. = 277.276 cubic ins.
 " quart = 2.5 lbs. avoird. The pint 1.25 lbs. avoird. = 20 oz. distilled water.
 " bushel = 8 gallons = 2218.192 cubic ins. = 80 lbs. avoird. of water.

10 cubic ft. of water weigh = to 11 cubic ft. of ice.
 35 cubic feet; also 35,943 cubic feet = 1 ton.
 Specific gravity at 60° = 1.000; and weighing about 62½ lbs. per cubic foot. GRAVITY.

Water in wells and springs in general is about 52° Fahr.
 Force of water, 1½ ton per square foot; CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 294.

WATER; as used with materials. All plastic materials should be mixed in the first instance with the smallest possible quantity of water, and then be "beaten" into a state of consistency for use, with a wooden beater; but instead of even a moderate amount of beating, the "stuff" is too often drenched with water until it is in a state but very little better than "slush". Suppose a cube yard of stuff to contain a couple of pails of water over and above what would be required if properly treated, as is too often the case. A pail will hold about three gallons or about 832 cubic inches. Thus it will be seen that the yard of material is swollen in bulk by the added liquid to a twenty-third part beyond its original capacity, and as every particle of moisture contained therein must be evaporated, as the plastering dries, shrinkage must inevitably follow, demonstrated by "cracks". In the case of a more than usually thick floating coat it has been known to shrink to such an extent as to have left the pricking up, causing a complete separation of the two coats of plastering. None but clean sharp sand will ever form good mortar, and the intimate mixture of the sand and lime, which should be done with a moderate quantity of water, is of no less importance; PASLEY, *Observations on Limes*, 8vo., 1838, p. 6; 2nd edit., 1847; who p. 24 notices the use of hot water on lime. HORMANUS, *Vulgaria*, 1519, p. 242b, notices mortar being tempered with hot water.

WATER; in symbolism. On Egyptian monuments it is represented by parallel zigzag lines; this was its earliest and simplest form, and it is seen on the rudest pottery of the flint and bone age. On Etruscan and other ancient vases; around doors in Assyrian architecture; the ZIGZAG ornament in early Norman work may represent water; as the VITRUVIAN SCROLL in Greek work is said to do. The large figure of S. Christopher, in mediæval art, is always represented standing or wading in water formed of long wavy lines ending in a small roll.

WATER BAR. A small thin plate of metal standing about 1 inch high and let into the cill of a door or casement, for the purpose of excluding the draught and damp. The door shuts against the metal and with a well-weathered fillet or molding fastened along near the bottom edge of the door itself, is found to be usually sufficient for this purpose. R. PARVINS "window sill to keep out wet", is shown in SOCIETY OF ARTS, *Transactions*, 1829-30, p. 158 with plate. The self-acting water bar for French casements was patented before 1844 by T. Smith; *BUILDER Journal*, 1844, vii, 208-9, with cuts; and 1858, xvi, 716; it is figured under FRENCH CASEMENT. Elliott's patent perfect simplex water bar, 1884, comprises a sort of horizontal trough under the bottom rail, shutting against one side of another set in the cill. In the *BUILDING NEWS Journal*, 1878, xxxiv, 458, a "water check to a sash" is described as a ¾ in. bead tongued into the top of the oak sill and a rounded groove formed in underside of lower sash to shut upon the bead; with also a galvanised iron or zinc tongue to oak and stone cill. Another or inside stop about 2½ ins. wide, rebated to form throat or check, and the sash shutting down on it and being grooved on its under side. WATER-TIGHT CASEMENT. 1.

WATER; BUILDING IN. See WATER FOUNDATION.

WATER BOUND. A condition of brickwork exposed to

continuous action of water, where the uncombined lime of the mortar and the soluble silicate of the bricks no doubt enter into combination with the alumina in the latter, and form an insoluble double silicate of lime and alumina. BRICKWORK (p. 147).

WATER CEMENT. This term was used by SMEATON, *Edystone Lighthouse*, fol., 1793, p. 103, in the chapter on "A compleat composition for water cements"; and PASLEY, *Observations on Limes*, etc., 8vo., 1838; 2nd edition, 1847, p. 12, has "Water limes or Hydraulic limes"; and p. 28 (par. 41), "Of the water cements of England absurdly termed Roman cements and of the mode of testing them, etc."

WATER CHECK to a sash. See WATER BAR.

WATER CISTERN. See CISTERN. One of glazed stoneware from 15 ins. to 3 ft. diam. holding from 50 to 300 gallons, newly invented. *BUILDER Journal*, March 20, 1858, xvi, 197, and 237, notices that if a standing waste of 6 lb. lead be inserted it will yield sufficiently to prevent the expansion of water when freezing from acting on the sides of the cistern. RAINWATER CISTERN AND TANK.

WATER CLOSET. A term applied to a small room in which is placed an apparatus for conveying away exuvie and slop refuse, by means of a flush of water. GARDEROBE. PRIVY. DRAUGHT. LATRINA. The "valve closet" apparatus was invented about 1800 by J. Bramah; another invention from about 1780, is called the "pan closet"; but the "valve closet" has now nearly superseded it from its greater cleanliness, as the "container" and D TRAP are not required. In the plans of French houses of the earlier part of this century this apparatus is introduced as the *Cabinet Anglais*—and *Garderobe de commodité ou lieu à souape côté*, KRAFFT, *Recueil d'Arch. Civile*, 1812, pl. 55; *Lieu à souape*, in BLONDEL, *Maisons*, 1737, ii, 139. A simpler apparatus is the HOPPER PAN introduced chiefly for servants' and workmen's use, and made of the stoneware manufacture. Various inventions have been put forward for "trough" closets for schools and workshops with an apparatus for periodical flushing; (TROUGH). *Water closets in The Sanitary News of Chicago, U.S.A.*, for December 1883, gives the history and examples. Also GLENN BROWN, *On Water Closets*, New York, 1885; reviewed in *BUILDING NEWS Journal*, 1885, xlix, 243. EMPTAGE, *Merits and Demerits of various kinds of water-closets in general use*, in THE SANITARY RECORD for 15 October 1883, p. 187. ENCYC. BRITT., 9th edit., 4to., 1886, xxi, 716.

WATER COLOUR. Those colours mixed up with gum water instead of oil. The term given to colouring or distempering a room, in PINCOT, *Coach and House Painting*, 8vo., n.d., p. 19. "Waterwork" or stencilling, is mentioned in SOCIETY OF ANTIQUARIES, *Proceedings*, 1847, p. 197. STENCIL.

WATER CONDUIT. See CONDUIT, properly Conduit head. NYMPHEUM.

WATER COURSE. A conveyance for rainwater from the top of a building. By the act 11 George I., after June 24, 1725, the water from the top of a house, balcony, penthouse, etc., is to be conveyed by party pipes into the channels on forfeiture of £10 for every offence. 4.

WATER COURSE. A cutting made for a stream or flow of water, as a catchwater drain from land, or leading to and working a mill. One temp. 12 John, 6 ft. wide and 5 ft. deep, is noticed under WATER-MILL. LEAT, or leam, in the fen country, is a water-course or level for the conveyance of water.

WATER CRANE also WATER STATION. On a railway; the former is an apparatus for supplying water from a main: the latter from an elevated tank, which is connected with a well, to the tender of a locomotive engine. An hydraulic crane of this sort is given in BRES, *Railway Practice*, 4to., 1847, 4th series, pl. 39. Another (Fr. *réservoir alimentation*) in ANNALES DE LA CONSTRUCTION, fol., Paris, 1857, iii, 5-6. DERRICK.

WATER DRAIN. Any small channel, or aperture for the escape of water; PISCINA. The LAVATORY behind the screen in

a hall. In Dacre Castle, Cumberland, is a very perfect one similar to a piscina in a church; one at the Moat house, Appleby, Westmoreland; another at the Abbot's house, Wenlock, with gargyle, xv cent.; TURNER, *Dom. Arch.*, 8vo, Oxford, 1851-9, ii, 45-6; iii, 73-4, 129. Another at Ely Porta.

WATER FILTER. Dr. Angus Smith remarks that water, from whatever source it may be derived, cannot be kept for a long time in a state of purity, unless upon a very large scale, and that it is advisable to use it as soon as possible after it may have been collected or filtered. Stagnant water may be purified by mixing with it a compound of 1 part of quicklime and 2 of alum; or 4 of animal charcoal and 1 of alum, in the proportions of 1 of the compound in volume to 1000 of water, and leaving them in contact for a night. It might be preferable to throw in the powdered charcoal overnight, and add the alum on the next day. At the Cape of Good Hope, where the frontier rivers were muddy, a lump of alum about half-inch cube was put into two quarts of water, which after a few hours became fit for use. ETON, *Turkey*, 8vo, 1798, p. 231, describes filtering wells by ascension as very ingenious. BUILDER *Journal*, 1889, lvii, 213, 230, 248. FILTER. VENETIAN CISTERN or well.

WATER FOUNDATION, or building in water. "Near the two mile stone on the Harrow road, the formation of a waterproof foundation by means of burnt clay, on the patent principle is now taking place"; GENTLEMAN'S MAGAZINE, 1820, xc, pt. 2, p. 368. Foundations of Westminster bridge, in BUILDER *Journal*, xiv, 453; of London bridges, 1857, xv, 752; and ROYAL INSTITUTE OF BRITISH ARCHITECTS, *Sessional Papers*, 1857-8, p. 31. PENNY CYCLOPEDIA, 2nd Supp., s. v. Bridge. DALY, *Revue Générale*, 1841, ii, 266-7. REPERTORY OF ARTS, *On the Economical Construction of the Piers of Bridges*, by J. W. Boswell, 1812, 2nd Ser., xxi, 90; 144. SEMPLE, *Treatise on Building in Water*, 4to. Dublin, 1776; and 1780. *Raccolta d'autori Italiani, che trattano del motto dell' acqua*. NEVILLE, *Pressure of water and strength of Cofferdams*, in CIVIL ENGINEER, etc., *Journal*, 1840, iii, 79. THORNBERG, *Essais de bâtir sous l'eau*, fol., 1774. CORNISH, *The Management of Tide Work*, read at LIVERPOOL ENGINEERING SOCIETY, June 1879. CONCRETE. COFFERDAM. CYLINDER. FOUNDATION. PILE. S. PETERSBURG. POLA. VENICE.

2. 14.

WATER GLASS, or oil of flint. Soluble glass, or the soluble silicate of potash or of soda. A solution of boiling glass—such as is used by the fresco painters of Munich—the very substance is sold in Italy for the purpose of preserving wood from the effects of fire, and is known by the name of *liquore di celce*; ALL THE YEAR ROUND *Journal*, 1863, ix, 474. But experience in London does not concur in this, if the two materials be alike; BUILDER *Journal*, 1861, xix, 488. It is asserted to be efficient in the pamphlet *Water-glass, its use and application*, 8vo., London, 1858. In addition to the article KUEILMANN process for preserving stone (patented 1841); the references following may be useful:—*Water-glass paint for hot-water pipes*; BUILDER *Journal*, 1868, xxvi, 846; xxvii, 890. *Water-glass as a preservative of materials*; CIVIL ENGINEER, etc., *Journal*, 1858, xxi, 297; BUILDER *Journal*, 1857, xv, 709; xvi, 403, 672, 700; xvii, 411, 484; and *Instructions for use*, by KUEILMANN, *idem*, 1859, xxii, 276; and by Ransome 292; from SOCIETY OF ARTS *Journal*; also RANSOME, in ATHENÆUM *Journal*, 1859, July, p. 115, claiming from 1844. FLAMMABILITY. INCOMBUSTIBLE. POTASSIUM. PRESERVATION OF STONE. RANSOME'S INDURATING PROCESS. SILICA; SILICATISATION.

WATER JOINT. This applies to pipes for the conveyance of water. FLANGE. SOCKET. UNION. SPIGOT AND FAUCET. WASHER AND WASTE. An "expansion joint" for hot water (Jones's) pipes 1875, is considered good.

A joint between two stones, in the paving of a terrace, where each side of the joint for about an inch is made level and then rounded into a sinking so as to prevent water lodging in the joint, especially if occasionally covered with it, as a

landing place to a river. The joint should be joggled or run with lead or cement.

WATER JOINT HINGE. A very useful hinge, not much known, for cellar flaps, ash-bins, and other horizontal doors exposed to the weather, because the working parts are not liable to become fixed by rust. For this purpose they are preferable to GARNETS. It consists of two bands of iron joined by welded loops which interlock. HINGE.

WATER LEAF. A term applied to the (ornament, a kind of lotus leaf) fragment found at Delphi and given by DONALDSON, in STUART, *Antiq. of Athens*, fol., 1830, p. 54, pl. 2.

WATER LEAVES. "1576-7, For xxxvj pounds of leade to make water leaves for the walls over the tower & chappell, iij. s. vjd."; WILLIS AND CLARK, *Arch.—of Cambridge*, Accounts of S. John's college, 4to., Cambridge, 1886, p. 623. Does this mean a gargyle, or a rainwater pipe-head, or perhaps flashing?

WATER MAIN. The large pipes, as main and submain, laid from a reservoir for the distribution of water in a town. In 1612 elm pipes were used by sir Hugh Myddelton from which water was carried into kitchens and cellars of subscribers' houses by leaden pipes. In 1700 they were made of a tree ordinarily of oak, or alder, bored with large iron augurs of different sizes beginning with a less one, the first being pointed, the rest formed like spoons, increasing from 1 to 6 ins. diameter; the pipes fitted into the extremities of each other; the method of boring is explained in NEVE, *Builder's Dictionary*, 8vo., 1703; 1736. 2,000 to 3,000 yards of spire elm pipes, of a bore of 4 inches diameter, in wood generally used for 5 inch bore,—the pipes to be of the very best quality of spire elm, to have strong iron hoops drove into their butt ends, and properly jointed, ready to be put together in the ground; LONDON CHRONICLE, advertisement, April 1788, p. 324. A main is now usually made of cast iron, in lengths of 9 or 12 ft. and from a small bore say of 3 ins. up to 42 ins. external diameter; at New York they had been made 7 ft. 6 ins. diam.; BUILDER *Journal*, 1860, xviii, 660. Wrought iron spigot jointed mains lined with hydraulic cement mortar are in use in San Francisco; B. J., 1863, xxi, 763. For the supply of Virginia city and Gold Hill, in Nevada, water was conducted across a valley seven miles wide and over 1,800 ft. deep; the average diameter of the pipes is 11½ ins.; all were coated inside and outside with asphaltum and coal tar boiled together. The inlet has a perpendicular height above the outlet of 465 ft.; BUILDER *Journal*, 1874, xxxii, 304. Cast-iron pipes should be coated with Dr. Angus Smith's preparation to prevent oxidation (before 1871); several others described in BUILDING NEWS *Journal*, 1871, xx, 385. *Water mains, making and laying joints, idem*, 1871, xx, 185. WATER PIPE. WATER SERVICE.

WATER MEADOW or irrigation. AIDE MÉMOIRE, 8vo., 1845-52, iii.

WATER MILL. A building having machinery worked by a wheel set in motion by a fall of water, and used for reducing material to powder, or for manufacturing purposes.

MILL. MILL-HOUSE. VITRUVIUS, x, 10, describes the construction of a watermill in terms not inapplicable to the mechanism of one in the present day. A flour-mill and bakehouse (*pristrinum et furnum*) were attached to every establishment of the Romans.

The mill of the abbey at Reading in Berkshire, which has never ceased to be used, is perhaps the most ancient and curious building of the kind now existing in England. It is of Norman architecture, richly embellished, and so well adapted to its purpose and substantially built, as to remain without material alteration of its internal arrangement; BUCKLER, *Abbey of S. Alban*, 8vo., Lond., 1847, p. 166. A representation of a watermill with three undershot wheels, as also a windmill, taken from a MS. of the fourteenth century in the Bodleian library, No. 264, are given in TURNER AND

PARKER, *Dom. Arch.*, 8vo., 1853, ii, 148-51; and states that the mill attached to Brougham Castle, Westmoreland, has still two wheels. About 12th year of king John, licence was granted to Philip de Gyney and his brother Frary of Whitwell in Norfolk, to build a mill in Hackford, with a watercourse to it through the lands of William in Hackford and Whitwell, of the breadth of six feet and five feet deep; NORFOLK TOUR, 8vo., Norwich, 1829, i, 233. A corn-mill (Fr. *moulin à blé*) at Dugny, by Cartier et Armengaud senr., is given in NORMAND, *Paris Moderne*, 4to., Paris, 1849, iii, 138. An iron house for a corn-mill, 50 ft. by 25 ft. and three stories high, was sent 1840 to Constantinople by Fairbairn; and also a woollen mill having two principal rooms 272 ft. long, 40 ft. wide, and 20 ft. high, and 280 ft. long, 20 ft. wide, and 20 ft. high, the whole covering nearly three acres; INST. OF CIVIL ENGINEERS, *Minutes*, 8vo., 1843, ii, 126. Flour-mill, Upper Thames street; BUILDER *Journal*, 1850, viii, 573, 587. BEGUILLET, *Manuel de menuisier et du charpentier de Moulins*, 8vo., Paris, 1775. ROLLET, *Mémoire sur la menuiserie, la boulangerie, etc.*, 4to. and fol., Paris, 1847. FAIRBAIRN, *Mills and Mill Work*, 8vo., pt. i, 3rd edit., 1871, and pt. ii, 1863. BLACKIE, *Engineer and Mechanic's Assistant*, 8vo., 1862. BANKS, *On Water Mills*; Smeaton on Mills, 8vo., 1815. BARLOW, *Millwork*, 8vo., 1841.

WATER-PIPE. A tube of any form, of metal, pottery, glass, wood, leather, or gutta-percha, for the conveyance of water. Varieties and manufacture in lead are given s. v. LEAD PIPE. Wood occasionally gives a disagreeable flavour to the water. Pottery will not support a great pressure of water. Pipes of cast iron and of wrought iron for large ones are generally preferred. Lead pipes of large dimensions are now seldom used. Stone pipes have proved a failure. **AUTJAGE; PIPE; WATER SERVICE; WATER MAIN.**

A 5 in. cylindrical tube, a yard long, of reddish clay well baked and perfect, was found by K. Loftus at the ruins of Sinkara. The Romans in the Augustan age constructed of potters' clay the pipes employed in their aqueducts; and when in Britain, they established potteries in Staffordshire and elsewhere, for the manufacture of such water-pipes; some specimens were dug up about 1750 in Hyde Park; they were about 2 ins. thick, the cement for the joints was a mixture of mortar and oil. Earthen tubes 22 ins. long, and 2 to 3 ins. diameter were found at Lincoln Castle, as mentioned by KING, *Observations on Ancient Castles*, in ARCHÆOLOGIA, 1782, vi, 265, pl. 30; and GOUGH'S CAMDEN, *Britannia*, fol., 1789, ii, 257, pl. 7: BIRCH, *Ancient Pottery*, 8vo., 1873, i, 164, perhaps the same as the following. Circular earthenware pipes 6 ins. diam. and 22 ins. long, set in a thick casing of cement to exclude the air and to protect the piping, once conveyed water from a spring in Nettlesham parish, Lincolnshire, to Lincoln, a distance of 1½ mile. There is a considerable rise from the spring, consequently the Romans must have propelled the water thence by art; ASSOCIATED SOCIETIES, *Reports and Papers*, 1859-60, p. 102; TROLLOPE, *On Apethorpe Villa*, in BUILDING NEWS *Journal*, 1859, v, 839. At Walpole in Norfolk, at 3 ft. in depth, many earthen water-pipes were found in a tender state, made of the same earth as were urns (Delft ware). The colour was of a palish pink, and hardened again in the air. They were 20 ins. long, three-quarters bore, half-an-inch thick, and one end diminishing to be inserted in the other. About 1760 earthen pipes about the same length, etc., but which appeared to have been glazed, were turned up in Fleet street; no doubt they were ducts belonging to the ancient conduit. At Soddington, Worcestershire, were found 1807 numerous tubes for water, formed of finest clay, well baked, of a grey colour outside but dark inside, each 2 ft. long, 4 in. diam., the aperture 1½ in.; having hollow tenons at one end, and mortices at the other, so as to fit together air-tight without mortar; GENTLEMAN'S MAGAZINE, 1807, lxxvii, ii, 1009.

Lead pipes. Abderahman king of Spain, constructed in 210

and 233 at Cordoba, beautiful mosques, with marble fountains, and caused pure water to be brought from the mountains through tubes of lead. A Roman lead pipe was found at Arles, that extended under the Rhone for conveying pure water from one bank to the other. A pipe of 3 ins. bore, made of flat cast-lead plate $\frac{7}{8}$ in. thick, rolled up and soldered, similar to the form and make of a Roman "fistula", with a joint, and dating probably 1401, was found 1854 in Old Broad street, City, about 3 ft. 6 ins. under ground. It is figured in *Journal of ARCHEOLOGICAL ASSOCIATION*, 1855, xi, 73. Some found at Lyon, perfectly agreeing in form with those described in VITRUVIUS, are figured in CRESY, *Encyc. of Engineering*, p. 667. Lead pipes 2 ins. diam. were laid by cardinal Wolsey to supply Hampton Court palace with water from a distance of nearly 3½ miles; one is figured in BRATLEY, *Surrey*, 4to., Dorking, 1841, iii, 55. 1538-39, 30th Henry VIII, the manner of casting lead pipes was invented by Robert Brock, chaplain to the king, Robert Cooper, goldsmith, making the instruments and putting the invention first in practice; RAPIN, *Hist. of England*, by Tindal, 8vo., 1731, vii, 705.

The deposition of the earthy salts contained in spring water takes place in the channels or pipes in which it may be conveyed; for instance, in the aqueduct passing over the Pont du Gard at Nismes, the sectional area is contracted by a deposition of carbonate of lime; and where the water contains the hydrous oxide of iron, the interior capacity of the pipe is diminished by a deposit of that material with rapidity. FELLOWS found at Perge in Asia Minor that the deposit had filled up the old aqueduct. When settlements in a roadway occur, a leaky joint of a gas-pipe may cause the gas to percolate the soil, and so by the water-services into the cisterns and houses; JAMES MUIR of the New River Company, in INST. OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1844, iii, 308-10. DARCY, *Fontaines publiques de Dijon*, 4to., Paris, 1856.

Water-pipes require protection in winter so that the liquid in them shall not freeze; in freezing, as water expands one-twelfth of its bulk, the pipe or other receptacle is cracked. Salt water does not freeze in England. In 1867 Kidd's patent safety apparatus was used in Dublin. "Doulton's patent compression chamber for preventing the bursting of service-pipes during frost" is figured in his trade list of January 1890. For ordinary purposes, pipes when exposed require to be covered with felt, flannel, or other material during frost or placed in a box filled in with sawdust. **WATER CISTERN.**

WATER-PIPE HEAD; rain. A receptacle for the collection of water from a gutter as to a roof, before it enters into the down pipe. It is of iron, or cast lead. It takes the place of the gargyle, WATER SPOUT, and lion's head of the ancients, which shot out the water forward.

WATER PLANT. See LOTUS; PAPHYRUS; WATER LEAF.

WATER-PRESSURE ENGINE. The Robinet is a direct action water-pressure self-acting pump, for the same work as by the ram, by using a low fall and large quantity of water it raises a smaller quantity to a greater height. BARBER, *Engineers' Sketch-Book*, 8vo., 1889, p. 126, 216. NEVILLE, *Pressure of water—cofferdams*, in CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 79. HYDRAULIC RAM; and RAM. PUMP.

WATERPROOF BRICKWORK. When perfectly dry in summer, porous brick or stone work may be well washed in linseed or boiled oil in two coats. BRICKWORK; waterproof, gives John Sylvester's receipt, CIVIL ENGINEER, ETC., *Journal*, 1843, vi, 466; same as by B. FERREY. In 1851 J. Workman received a prize medal at the Exhibition of the Industry of All Nations for an ingenious and apparently effectual method of rendering common bricks waterproof at a cost of about 6s. per thousand: it takes place either during the first manufacture or after the brick is completed; *Jurors' Reports*, 1851, p. 581. Professor Church's stone-preserving, brick waterproofing process, known as "the combined patents"; BUILDER *Journal*, 1869, xxvii, p. 849; 869. Gay and Co. of Alton devised

an "Invisible process", which is detailed in *BUILDING NEWS Journal*, 1870, xviii, 355. A "bright American varnish" is given in *B. J.*, 1866, xxiv, 311.

WATERPROOF PAPER. See WILLESSEN PAPER. See PAPER, waterproofing (p. 35a); PAPER ROOF. PASTEBOARD ROOF. By "Chemical papers company", described in *BRITISH ARCHITECT Journal*, 1885, April, p. 191. "Muraline" as manufactured by the patent wall hangings syndicate limited is stated to be a washable, waterproof, and non-poisonous paper.

WATERPROOF ROOF. Lord STANHOPE's composition, 1797. Martin's preparation for coating roofs, etc., to render them impervious to wet. Mulholland's patent fireproof and waterproof roofing, flooring, and covering; CIVIL ENGINEER, ETC., *Journal*, 1855, xviii, 431. W. E. Newton, patent 3 March 1857; *B. J.*, 1858, xvi, 186. 1863 patent roofing, waterproof and sunproof (Rigg, Great Winchester street) 36 ins. and 40 ins. wide in continuous lengths, any colour, light, no smell, easily fixed or removed. "Lapidar" was a German invention about 1870 for protecting or repairing any roof, or substance, being a good waterproof material. ASPHALTE. CEMENT.

WATERPROOF WHITEWASH. See WHITEWASH.

WATER PURIFIER. See FILTER. WATER FILTER.

WATER RAM. See WATER PRESSURE ENGINE.

WATER RESERVOIR. See RESERVOIR or TANK. CONDUIT. CISTERN to a dwelling. The ROMAN PISCINA. PANT. RAIN-WATER CISTERN. BUND. POND. LAKE. RAINFALL. WATER CISTERN. WATER TANK.

WATER SERVICE. The supply of water to a house from the WATER MAIN. In London "low service" is understood to mean that the water is delivered at heights varying from 6 to 9 ft. above the roadway; "high service" to a height now depending on the pressure maintained by the company and of the position of the premises. Water companies and corporations supply "regulations to be observed in laying on water" to buildings.

Quantity of water calculated to be consumed for private purposes:

A bath on the average 70 to 75 gallons.

A horse per day (4 gallons being with food) 16 gallons.

A two-wheel private carriage per day 9 gallons.

A four-wheel ditto " 16½ gallons.

Each individual per day, 4½ in France, 10 England.

Every yard sup. of garden ground ½ gallon.

" " paved court or passage 1 gallon.

" " railway, per service ½ gallon.

On board ship the allowance is 1 imperial gallon per man per day.

The quantity for human consumption appears small, but the English town population even in the driest summers, does not consume more than about 8 (or 10 with bathing) gallons per head per day of 24 hours. The quantity for any given population may be reckoned at 20 (to 30) gallons per head per day, which will include all ordinary trade consumption required. The daily supply for house purposes throughout London averages more than 25 gallons per head—from 21 gallons by the Southwark and Vauxhall company, to rather more than 34 gallons by the Lambeth company. The occupants of houses of the unwealthy classes barely consume 6½ gallons per head per day. In model lodging-houses or artisans' dwellings, 7 gallons have been found sufficient, even with a constant supply; but 25 gallons have been used. 20 gallons are calculated as an ample supply for use, but London (1867) takes 25 gallons, apart from manufacturing and public purposes. In the returns of the Board of Health for 1851, the average metropolitan supply was shown to be at the rate of 15.13 gallons per house per day, or rather more than half as much again as was necessary according to the Board, who held that from 80 to 100 gallons were sufficient.

At Barking in 1869, where water was sold at one farthing a pail, the supply to a house of £30 to £40 a year rental was said to be 8 or 10 gallons a day. A family of six persons should have a daily store of 100 gallons for all purposes, *i.e.*, about 16½

ARCH. PUB. SOC.

gallons each person. At lunatic asylums, say the Scottish commissioners, 40 gallons per day should be allowed exclusive of rainwater, instead of 25 gallons; *BUILDER Journal*, 1860, xviii, 4.

1852; 45,000,000 gallons was supplied by ten London companies, *i.e.*, about 12 gallons each person; sir W. Clay estimated the quantity required for a family was an average of 12 gallons a day. 1888, July; Supply 169,387,002 gallons daily; population of 5,488,648; giving 30.86 gallons. 740,275 houses, or 228 gallons each house; 1,180½ miles of streets supplied (in 1889, were 1,208½ miles of streets). 1890; Total daily supply was 166,942,482 gallons, with a population of 5,581,491, gave 29.91 gallons per head, or 222 gallons per house for all purposes.

1863. Water consumed in country towns per head per day; Nottingham 17 galls. Derby 19 galls. Sheffield 18 galls. Manchester 21 galls. Salford 17 galls. Bolton 16 galls. Bury 16 galls. Sunderland 15 galls. South Shields 15 galls. Berwick 16 galls. Norwich 14½ galls. The average of the whole being 17 galls; *Sheffield Independent*, March 24, 1863. Large towns 30 gallons per head; with a reservoir for eighty or ninety days' supply; BATEMAN, in *BUILDING NEWS Journal*, 1871, p. 357. HUMBER says the average quantity actually consumed per head of the population, varies from about 15 gallons per day as at Norwich, to more than 50 gallons as at Glasgow, for all purposes, domestic, trade, streets, flushing, and fires; the domestic consumption was found to be 10 gallons, as tested by meters (*BUILDER Journal*, 1876, xxxiv, 1184). 1888; average supply afforded by the waterworks throughout the country is usually taken at from 30 to 33 gallons daily; allowing one-fifth of that for trade purposes gives a domestic supply of from 24 to 26 gallons per head. At the Chesterfield Union, Derbyshire, in 1875 a storage of 25,000,000 gallons was provided, giving 12 gallons per head per day for 173 days, besides ample supply for trade purposes. BAYLES, *House Drainage and Water Service in Cities, Villages, and Rural Neighbourhoods*, 8vo., New York, 1878.

With the constant supply, as at Hitchin, the average consumption has been about 235 gallons per house per day. At Croydon, once to 500 gallons. Whitehaven about 250 gallons (or 50 gallons per head). York 200 gallons. Exeter at least 120 gallons. Bristol, the waste was so enormous that the constant distribution was abandoned. Nottingham had not exceeded 20 gallons per head per day, and the same at Durham, but rose after some years to 25 gallons, showing very stringent powers to be necessary to prevent waste. At New York, not less than 90 gallons occasionally; and at Boston, U.S.A., not less than 55 gallons; (1850, BURNELL.) 1867, at Manchester the constant supply was 14 gallons per head per day. Much of this discrepancy may be due to causes other than carelessness of the householders. Mains may be laid too light, and laid by contract, trumpery fittings, wrought instead of cast-iron mains whereby leakage ensues, and hence great loss of water. Gravelled roads in hot dry weather require more water, which may or may not be charged to house-supply, so a fictitious house-supply average, results. WINTER BLYTH, *Manual of Public Health*, 8vo., 1890, who recommends a constant supply with a minimum of 30 gallons per day per head of population; *BUILDER Journal*, 1891, ix, 221.

WATER SERVICE-PIPE. The iron pipe belonging to the water company, from which the lead "communication pipe" leads to the cistern or butt of a dwelling. This latter pipe must have a bore of not less than three-quarters of an inch, be of a weight not less than 2½ lbs. per foot, and be laid at a depth underground of at least 2 ft., and be otherwise well protected from frost. If of larger bore it must be proportionably heavier. On it there must be a stop-cock near where the pipe enters the premises, and the cock must have a waterway at least equal to that of the pipe, and be of approved construction; (New River Company). In the Chelsea waterworks district, the ¾ in. pipes

weigh $2\frac{1}{2}$ lbs. per lineal foot. In Lambeth rarely more than $1\frac{1}{2}$ lb. For constant service, at least $2\frac{1}{2}$ lbs. for a half-inch pipe would be the least weight required.

In 1585, a six gallon tankard of water cost 2d.; no one at the present day really uses much more than 6 gallons per day, or about one-seventh part of the 40 gallons per head at which Mr. G. R. Burnell estimates the actual supply; *BUILDER Journal*, 1861, xix, 114. In 1612 from the elm main pipes used in the city, water was supplied to the kitchens or cellars of the subscribers' houses by lead service-pipes of $\frac{3}{4}$ in. bore. In 1696 a house in Coleman street was supplied by "one small watercourse of water running through a small brass cock" paying 20s. fine and 20s. quarterly. In 1783 it is stated that the water was supplied "three times a week for the trifling expense of six shillings per quarter".

WATER-SHED. A catchment basin; DWYER, *Hydraulic Engineering*, 8vo., Dublin, 1847. **WATER STORAGE.**

WATER-SHOOT, or square shoot, or water trunk. The wood trough formerly and still sometimes used in country buildings, to convey rainwater from gutters. They are formed square, the joints ploughed and tongued, and put together with white lead, and the whole well pitched over, and then painted. Proper hopper heads and shoes are required. If the water from the gutter be brought into the trunk against its back, and the trunk be inclined a little forward at the bottom, a face to the trunk is not required, and then the inside will always be available for painting. **TROUGH GUTTER.** **TRUNK.** **VERTICAL GUTTER.**

WATER-SPOUT. A hollowed stone projecting beyond the face of a wall to lead the water from a gutter or flat. One to the walls of Pompeii is shown in MAZOIS and GAU, *Pompeii*, fol., Paris, 1812, i, pl. 12 and 13. A dragon's head waterspout formerly on the Gewerken-haus at Eisleben, is engraved in *Journal of the Society of Arts*, July 5, 1861, p. 597; and in *BUILDER Journal*, 1861, xix, 527. A mediæval example in TURNER and PARKER, *Dom. Arch.*, 8vo., Oxford, 1859, iii, 150, etc.; another at Woodford church, in *Churches of the Archdeaconry of Northampton*, 8vo., 1846-9, p. 86. **GARGOYLE.** **LION'S HEAD.** **SPOUT.** **WATER LEAVES.** **WATER-PIPE HEAD.**

WATER STAIRS. The steps to, or the CAUSEWAY on the shores of a river by which access is obtained to a barge or boat. In the XV and XVI centuries they were called "bridges". 1610, "took water at the Privy staires at Whitehall, and landing together at Westminster bridge his majesty passed directly to the parliament house"; this bridge was also called "the queen's bridge" by Camden; they returned by "the king's bridge"; the ancient water gate is engraved in SMITH, *Antiq. of Westminster*, 4to., 1807-9, p. 28. NICHOLS, *Progresses, James Ist*, 4to., 1823, ii, 327. Ivy bridge, Strand, was another well known on the shore, all these were extinguished by the embankment 1862-70.

WATER STATION. See **WATER CRANE.**

WATERSTOOLE. "A marble waterstoole with a cistern and water laid to it, a marble Beaufett and two new doores at S. James, for the Dutches of Munster, in the lower lodgings," April 1718: Extract from records at Office of Works. W. R.

WATER SUPPLY. The cold water comprises wells, pumps, rams; conduits; tanks and their construction, materials, fittings, pipes, etc.; feed-cisterns; water-closet supply-tanks, etc.; fire mains and buckets. The hot water supply comprises circulating cylinder and cistern; covering and fixing of pipes; soft water, its advantages and cost, for kitchen and laundry purposes; rainwater collection tanks, and storage; and the service to a house. **WATER CISTERN.**

Water supply to a monastery. SHARPE, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1870-71, p. 202. The perfect system to the great monastery at Canterbury, XII century, is shown in a map preserved in the library of Trinity College, Cambridge, and often engraved; prof. Willis traced out the water-courses; PARKER, *Domestic Architecture*, 8vo., Oxford, 1859, iii, 149.

The supply of water if from a long distance, is conveyed in open channels, by covered aqueducts, or in pipes. The Romans have left those at Evora, Merida, Segovia, Nîmes, Metz. In 1858 only three of the fourteen aqueducts of ancient Rome were in use; it was then proposed to restore the Marcian aqueduct which derived its source from a spot on the Esquilian hills, thirty-three miles from Rome; this water being considered the best that came into the capital was reserved for drinking; the pope authorised the architect Moraldi to commence the survey. The Romans formed small wells at distances of about 300 ft. to allow the deposition of any extraneous matters in suspension; inspection and air funnels were placed at convenient distances. Between Mount Pila and Lyon is a remarkable syphon bridge crossing a valley about 2,600 ft. wide with a depth of 217 ft.; the pipes of lead of $8\frac{1}{2}$ ins. diameter lead into two of 6 ins., along a level, and for the first half of the ascending limb where they were reunited to one of 8 ins. diameter. Later works exist at Constantinople. The souterazici of the Lower Greece and Turkish empire are pipes from an upper reservoir, descending and rising to a series of reservoirs on diminishing levels, about 500 or 1,000 ft. apart, the difference of level between the water in the two separate reservoirs being usually 4 ins. **AQUEDUCT, Detached Essay.** The moderns formed those at Spoleto, Genoa, Caserta, Lisbon, Marly; Roquefaveur near Lyons; canal de l'Oure; the Croton aqueduct; the New River. The waters from loch Katrine were thirty years since brought to Glasgow by J. F. La Trobe Bateman, C.E., and he designed the great scheme for connecting Thirlmere with Manchester. Newcastle, Halifax, Blackburn, and other towns are indebted to him for water supply; he also proposed to supply London from Bala lake in North Wales. The Vyrnwy embankment of the waterworks at Llanwyddyn, about seventy miles distant, to supply Liverpool, was laid 14 July 1881, Thomas Hawksley and G. F. Deacon, engineers.

HUMBER, *Water Supply of Cities and Towns*, 4to., 1876; LATHAM, *Supply of Water to Towns*, 8vo., 1865; read before the Society of Engineers; printed in *CIVIL ENGINEER, etc.*, *Journal*, 1865, xxviii, 19, 40; *Storage and Distribution of Water for the Supply of Towns*, *idem*, 1869, xvii, 440, 474; COLYER, *Water Supply, Drainage, etc.*, 8vo., 1889; *Water Supply*, in *BUILDER Journal*, 1889, lvii, 13, etc.; LUCAS, *Rural Water Supply*, in *INST. OF SURVEYORS, Transactions*, xiii, 151; HUGHES, *Water-works for Cities and Towns*, 12mo., 1859. WINTER BLYTH, *Manual of Public Health*, 8vo., 1889. JACOB, *Storage Reservoirs*, 8vo., 1867. *INST. OF CIVIL ENGINEERS*, papers read, see index of subjects; including RENNIE, Historical notice, in *Address*, 1846, v, 58. *ENCYCLOPEDIA BRITANNICA*, 4to., 1888, xxiv.

WATER-TABLE (Fr. *biseau*; *chanfrein*; *glacis*). A WEATHERING, as to a string-course. An inclined plane on the top surface of a projecting stone for the purpose of turning off water; it is chiefly used to the set-backs of buttresses, and string-courses. A large stone cornice is often worked backwards or inwards to prevent drips at the edge, and covered with lead to prevent the rainwater soaking through and destroying the stone. Strings are so treated. PUGIN, *True Principles*, etc., 4to., 1841, s. v. Weatherings, p. 12. VIOLETT-LE-DUC, s. v. Cathédrale, p. 317-20, has given an interesting explanation of the blocks (*carrioux*) or sort of battlement left upon the water-table of the cornice, at the height of the ailes, to the transept and choir of the cathedral at Reims; and shows from the notes made 1220-30 by Villard de Honnecourt, a friend of the architect R. de Coucy, that they were left as stepping-stones. The upper walls built at a later period were set back and thus the blocks were no longer necessary features.

When the top surface of a window-sill is worked inclined, for the purpose of throwing off water, it is said to be "sunk". **BUTTRESS.** **DRIPSTONE.** **HOODMOULD.** **SEVERALL TABLE**, severans, severonne, and severonde table. 25.

With gardeners; a water-table is the long hollow that lies

parallel with the grass walks, between the walks and the borders. 4.

WATER-TABLE. In brick or stone, a sort of ledge left in the wall some 18 ins. or 20 ins. above the ground, at which place the thickness of the wall is abated on each side the thickness of a brick, namely 2½ ins.; thereby leaving that ledge or jutting, thus called a water-table, which is sometimes plain or moulded. **OFFSET.** 4.

WATER-TABLE. In Gothic work, the lowest member of the base tables, as in the contract for the Legge building (i, 206); WILLIS AND CLARK, *Arch. Hist.—Cambridge*, 4to, Camb., 1886, iii, 621, with cut. It may be defined to be a projection, or set-off, one that allows the rainwater to trickle down the surface of the wall (CHAMFER), in opposition to the *larmier* or throat, which throws off the water; WILLIS, *Arch. Nomenclature*, 4to., Cambridge, 1844, p. 35. **GROUND TABLE.** **GRASS TABLE.** **EARTH TABLE.** **LEDGEMENT TABLE.** **CASEMENT.** **PLINTH.**

WATER-TANK. A large reservoir or cistern for a supply. Table of supply capacity and cost for rainwater tanks is given in LUCAS, *Rural Water Supply*, in INSTITUTION OF SURVEYORS, *Transactions*, 1880-81, xiii, 151. Lining for tanks; BUILDER *Journal*, 1863, xxi, 520, 537, 560. 1864, xxii, 379, gives a rule for ascertaining the strain on the sides of a cast-iron tank of large size. An old tank, or reservoir, to catch the rainwater from the roof is preserved at Hawarden castle, Flintshire, with an overflow drain to the moat. Another at Carrons Ashby, Northamptonshire; TURNER AND PARKER, *Dom. Arch.*, 8vo., Oxford, 1859, iii, 150. **WATER RESERVOIR.**

WATER-TAP. See BALL COCK. BALL VALVE. BIB COCK. COCK. FOURWAY COCK. STOP COCK. TAP. VALVE. THUMB TAP. There are high-pressure cocks; main cock; screw-down tap; patent perpetual spring self-closing cock; and numerous other similar appliances. **SANITARY RECORD**, 1885, p. 227.

WATER-TIGHT WINDOW. A sash, or French casement, so prepared by carpenters by working double beads in the hanging and meeting styles, and also at the bottom, that wet shall not drive in. There are several arrangements of casements in iron, bronze, or steel, to effect the same purpose. **WROUGHT-IRON WINDOW.** **WATER BAR.**

WATER-TOWER and tank. For the supply of water at a high level to a town, or for fountains. *Worthing*, 40 ft. square; by R. Rawlinson, C.E.; BUILDER *Journal*, 1855, xiii, 419; view, 1857, xv, 243. *Sydenham, Crystal Palace*; I. K. Brunel, C.E. B. J. 1856, xiv, 296, 337; failure of one tower, 1880, xxxix, 457, 470, view 512. *Croydon*; 1867 by B. Latham, C.E.; B. N. J., 1869, xvi, 112; view 119. *Colchester*.

WATER-TROUGH. See TROUGH for horses and for receiving human ordure.

WATER-TRUNK. See WATER-SHOOT.

WATER-VERGE. A term used in the north of England for a slip nailed on the bottom of the shutters to a granary, to throw off the rain; *LOUDON, Encyc. of Cottage, etc., Architecture*, 8vo., 1833, § 1117. It is usually called a *throat ledge* when applied to an ordinary outside door, or casement.

WATER WASTE-NOT REGULATOR; or water-waste preventer. A machine for flushing closets, urinals, etc., by the self-action of a syphon, but actually it only admits to closets the two or three-gallon supply as regulated by the water companies. There are many varieties, all depending chiefly upon the rate the water is let into the receiver by the stop-cock. They are usually fixed under the cistern; but where there is not height enough, some can be set in it. There are others of larger dimensions for the purpose of periodically flushing drains and sewers. Thus ROGERS FIELD, *On self-acting intermittent syphons and the conditions which determine the commencement of their action*, in BUILDER *Journal*, 1879, xxxvii, 1802; the form he finally adopted consisted of two concentric tubes, the outer one being closed at the top and steadied by radial ribs projecting from the inner tube. The annular space between the tubes constitutes the ascending or shorter leg, and the inner tube the descending or longer leg, of the syphon. **SYPHON.**

WATER-WAY. A term expressing the escape of water through, or at, the down stream face of a bridge. Widespread damage has often been caused in some mountainous parts of Ireland by the frequent failures of bridges. The channel or water-way for some distance above, through, and below the bridge, should be of equal discharging capacity, the channel below being on no account of greater water-way than the arches of the bridge. The object to be obtained is to convey the floods through and for some distance below the bridge in a comparatively moderate incline and velocity; KELLY, paper at INSTITUTION OF CIVIL ENGINEERS OF IRELAND, read January 1859; BUILDER *Journal*, 1859, xvii, 68.

WATER-WORK. See WATER-COLOUR and STENCILING.

WATERFORD. A city and seaport, the capital of the county of the same name, in the province of Munster, in the south of Ireland, situated on the river Suir, crossed by a timber bridge 832 ft. long, by Lemuel Cox. The quay 1,200 yards long is the finest in the country. The large building called Reginald's tower xi cent. is one of the most important of the early erections of the Norman chiefs; the walls very thick, with small openings enlarging within; the circular castle tower is 48 ft. diam. with walls 10 ft. thick and 50 ft. high; the stairs are in the wall. The bishopric early xi cent., has been united with Cashel. The Roman catholic cathedral dedicated to the Holy Trinity was built *cir.* 1800 at a cost of £20,000. The protestant cathedral, dedicated to the Holy Trinity and usually called Christ Church (Italian), was erected 1773 (ECCLESIOLOGIST *Journal*, 1852, xiii, 173-5); the bishop's palace, and the deanery erected *cir.* 1700 adjoin; a crypt under the latter was found 1850, it is 60 ft. by 19 ft. and 11 ft. high, with a barrel vault, and divided in its length by a wall with six arches (BUILDER *Journal*, 1851, ix, 394; and ILLUSTRATED LONDON NEWS, xviii, 587). There are also the parish church of S. Patrick; S. Saviour's by Goldie and Child, BUILDER *Journal*, 1878, xxxvi, 381, 515; other Roman catholic churches; several Dissenting chapels; the ruins of a Franciscan abbey with tombs of XV-XVII cents.; town-hall; court-house and jail of redstone; law-courts and savings-bank of granite; hospitals; artillery and cavalry barracks; and a large lunatic asylum of cut limestone. It was formerly known for its manufactory of glass. WILKINSON, *Geology, etc., of Ireland*, 8vo., 1845, p. 116, 183. WRIGHT, *Ireland Illustrated*, 4to., 1829, p. 65, 79. 14. 28. 50. 96.

WATERING-PLACE. A term commonly applied to a seaside summer resort; BUILDER *Journal*, 1865, xxiii, 631; and other volumes. Also applied to a small recess used as a urinal.

WATKINS (DAVID), 1618 grant of the comptrollership of the works at Windsor castle and other places for life, July 16; he was knighted by James Ist before 1624, when he had 3s. per day for such days only as he attends the king's service there; *ROLLS RECORDS, Domestic Series*, 8vo., 1858, p. 555; and 1859, p. 348.

WATSON (JOHN BURGESS), F.R.I.B.A., born 1803, became a pupil of W. Atkinson; 1824 he gained medals at the Society of Arts for a perspective drawing of a crane; and for an original design for houses in Greek architecture. He designed 1828 Staines church, Middlesex (GENTLEMAN'S MAGAZINE, xcvi, pt. 2, p. 393); 1838 Hook church, near Kingston, Surrey; Holmwood church; 1840 cottage for the Ornithological Society of London in S. James's park; 1858, additions to Ray Mead, Berkshire, for Albert Ricardo; a few parsonages, 1831, one at Norton, Hertfordshire; the National Provincial bank, Bishopsgate street (pulled down 1864); and other private works; and 1836 competed for the houses of Parliament. He was for forty years surveyor to the Pentonville estate; and practised landscape gardening, having a good knowledge of trees. He was three times master of the Farriers' company. He died 10 April 1881, aged 78, at Carondelet, Hornsey. One of his sons Thomas Henry Watson is a member of the profession.

WATSON (THOMAS), mason, 7th Feb. 1616, the baillies "to confer and deall earnestlie with T. M., in Rayne, for vndertaking

the bigging of the said wark, in sic forme and maner, and vpon sic conditionis as thay can aggree with the said Thomas"; i.e., "the bigging of a sufficient wardhous in the east end of the tolbuith"; SPALDING CLUB, *Aberdeen Burgh Records*, 4to., Aberdeen, 1844-48, ii, 331; the contract on p. 338-44, 357-8; and also 15 May 1622 he as master mason was at work on the tolbuith steeple, under "Robert Johnnestoun, maister of the wark", p. 376, 379.

WATSON (...), of York. 1804-14 designed at Beverley the sessions-house for the east riding, the gaol, and the governor's house, cost £8,550. 1819 with PRITCHETT, erected and published *Plans, etc., of the Pauper Lunatic Asylum at Wakefield*, fol., 1819; it has since been enlarged.

WATSON (CHARLES) of Halifax, 1843 invented the double current or DIAPHRAGM ventilator: it was early applied with success to the sessions-house of the Grey Friars church. 1.

WATTE (RICHARD), 1560 was clerk of works, store, etc., at Upnor castle, Kent, under S. Basyll as comptroller, and W. SPICER, surveyor. His accounts are in British Museum, *Add. MS.* 5752, f. 344, etc.

WATTLE. A twig or flexible rod; a HURDLE made of such rods; and a rod laid on a roof to support the thatch. As a hurdle it was used for rough centreing during the medieval period, to carry the newly made concrete in vaulting, as in the castle at KILKENNY. CENTRE. MAIDEN, *Wattles and Wattle Barks* (Acacia), 8vo., Sydney, 1890, advocating their culture.

WATTLE AND DAB. A wall made of upright stakes with canna or withs twisted between them, after the manner of a crates or hurdle, and then plastered. At Madresfield court, Worcestershire, the old house was partly cased with brick, the other with roughcast, the substantial construction was of timber filled in with wattle and dab; partitions appear to have been of wattle or wickerwork plastered with lime; STOWRYS or stakes. "Wattles (*virgæ*) and dalbyng stours for four chimneys," i.e., the framework for clay chimneys; SURTEES SOCIETY, *Finchale Priory*, 8vo., Newcastle, 1837, Gloss. Fragments of "daub and wattlework" were found in the Romano-British village during the excavations by PITT RIVERS, *Excavations in Cranbourn Chase*, 4to., 1887, i, p. 147, and plate. "The outside plaster fell off from the decay of the wattlework over the timberwork," is a note. DAUB, dalb, dawb, dab, and dash. RAD AND DAB. CONGRATITUS PARIETIS, or cratitius of VITRUVIUS, ii, 8; vi, 3, who condemns the use of it. LOAM. LUTUM. It differs from COB; or FORMARIUM OPUS. 7.

WAULTIER DE MEULAN. See MEULAN (W. de).

WAUTHIER (JACQUOT), also known as J. DE VAUCOLEURS. In 1499 he had, in concert with his brother John, built the bridge at Malzeville (Meurthe). On 7 March 1508 he is styled master mason of the works of the marquise of Pont-à-Mousson and master of the works of the duchy of Lorraine; July 1510 he was ennobled and appointed concierge of the ducal palace at Nancy, having carried out the portière of the palace; other works there in 1511 and 1512, and in 1513 completed the galleries for la dame, and the garden with a fountain therein. In 1522 he was master mason of the works of the bailliage de S. Mihiel. LEFAGE, *Les Offices*, etc.; and his *Palais ducal*, 1852; quoted in LANCE, *Dict. Biog.*, 8vo., Paris, 1872.

WAVE, also written way, wager, wey, weigh, webb, and waw. A quantity. 1384-5, two waws of iron; 1457 and 1508 a waw of glass is left in a will; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durham, 1859, p. 359. In 1471 one wave and a half and 28 wysps of glass, price per wave £1 13s. 4d.; BROWNE, *York Cathedral*, 4to., 1838-47, p. 251. 1567-76 a wave of Hessen glass contained 60 bundles, and to charge 32s. at most for the case, 21d. each bundle, and £3 the waye respectively; BURN, 254. WEIGHTS, wool weight.

WAVED GLASS, or JEALOUS GLASS of 1735. A ribbed glass.

WAVE MOULDING. The two roll mouldings following one another, as shown in the BASE OF A PIER in the second

Pointed styles (with cut). "The wave and bostred is greater than the plain between them"; I. Jones 1613-39, notes in PALLADIO *Architecture*, by Leoni, edition 1742, ii, p. 47.

WAVER, weaver, side waver. A term used in Yorkshire and Lincolnshire, for a FURLIN. "Side timber" in Somersetshire.

WAVERLEY (JOHN OF), 1237 mason, was paid £10 "for the work of our queen's chamber at Westminster; Liberate Roll; 8th May, 21st Henry III; TURNER, *Dom. Arch.*, 8vo., Oxford, 1851, i, 186.

WAVE SCROLL. An ornament much used in Egyptian decoration.

WAVING ENGINE. A kind of lathe or large vice, which by means of "an iron whose lower end is cut into the form of the molding you intend your work shall have", forms the curve as it passes under the iron; MOXON, *Mechanick Exercises* (Joinery), 4to., 1678, p. 103-5, with figure. A moulding tool.

WAVY ORNAMENT. A decoration in the Norman style, formed by the under end of a projecting face being cut in a wavy line, and the margin worked fair to show. 1.

WAWCER. An old way of writing vawcer, voucher, vowler. See VOUSOIR.

WAX. A solid fatty substance of animal and vegetable origin, allied both in sources and constitution to the fixed oils and fats. It melts at about 143° to 150° Fahr. It is a non-conductor of electricity. It is used for fine modelling, and in casting small works. When a founder makes a little figure in brass, he melts the bees'-wax and pours it into or on to the plaster mould. This wax figure is taken out in one piece and hollow; and the cavity being filled with plaster is left to dry, that it may serve for the soul or interior of the brass casting. The *cire perdue* process of casting is detailed in BRITISH ARCHITECT *Journal*, No. 7 for 1888, p. 129, from SOCIETY OF ARTS *Journal*, January 31st. *Wax Figures*, in ENCYC. BRIT., 1888, 9th edition, p. 460.

WAX PAINTING. See ENCAUSTIC PAINTING. The Grecian mode of work is explained in SOCIETY OF ARTS, ETC., *Transactions*, 1794, x, 168; also *Journal*, 1891, April 3, p. 376. Before 1828 the use of wax applied to stone and marble, as a repellent of moisture, was practically exhibited on the front of the then existing Athenæum club house, Pall Mall, by J. Henning, junr., as described in BUILDER *Journal*, 1847, v, 313. It was to be cleaned by washing it with the same mixture. Milk of wax is a valuable varnish. VARNISH.

WAXWORK. With painters in 1736, was a yellow painting in fresco work.

WAY and wage. A weight. See WAVE and WEY.

WAY or passage. Six species of way are known to law: 1, foot-way; 2, horse-way, being also a foot-way; 3, drift-way for driving cattle; 4, carriage-way for carts and other carriages, including a foot and horse-way, and usually but not necessarily including a drift-way; 5, water-way for ships and boats; 6, subway or passage underground in large towns. All these may be either public or private. COURT. SUBWAY. VIA. LANE. ROAD. PASSAGE. WATER-WAY. 14.

WAYCROFT QUARRY. See PORTLAND STONE.

WAYNE SCOTT. One of the old ways of writing WAINSCOT.

WAYSIDE CHAPEL or oratory. The remains of these solitary little mediæval buildings, though frequently met with, have not excited much interest. They evidently afforded to travellers, pilgrims, and people generally, in their journeyings, an opportunity at various stations to offer up prayers for safety. One formerly existed on Biddenham bridge, and on Bedford bridge early XIV cent.; at Meppershall, Bedfordshire and Herefordshire; on Wakefield bridge over the Calder, and Rotherham over the Don, both in Yorkshire (BUILDER *Journal*, 1890, lix, 406); S. Ives (*idem*, 425); Bradford-on-Avon, Wiltshire (*idem*, August 20, 1887); and on London bridge (*idem*, May 10, 1884; and January 7, 1888; and THOMSON, *Chronicles of London Bridge*, 8vo., 1827; 2nd edit., 1839, p. 68). Also on the bridge at Droitwich where the road passed through the

chapel separating the congregation from the reading-desk and pulpit. The chapel of S. Albright at Stanway, near Colchester, Essex, was probably one, being on the London road, Ikenild street, with a *hospitium* opposite to it, now the White Hart inn; BUCKLER, *Churches of Essex*, 8vo., 1856, p. 236. HARDING, *The Church and Chantry on the ancient Exe Bridge*; in EXETER ARCHITECTURAL SOCIETY, *Transactions*, 4to., Exeter, 1849, pl. 31, p. 165-72. BUCKLER, *Wayside Chapels*, 8vo., Oxford, 1843. SCATCHERD, *On Ancient Bridges and Bridge Chapels*, 8vo., 1843. HURST, *Wayside and Bridge Chapels*, read at Bedfordshire Architectural Society, *Builder Journal*, 1861, xix, 537. KERSHAW, *Ancient Bridge Chapels*, 4to., 1882. J. S. WALKER, *S. Mary's Chapel on Wakefield Bridge*, in YORKSHIRE ARCH. AND TOPOG. *Journal*, 8vo., 1890, xi, 143. 4.

A plan of a chapel near Fondi, on the road from Rome to Naples, is given in LECLÈRE, *Recueil d'Architecture*, fol., Paris, 1826, pl. 97. GUENEAULT, *Dict. Icon.*, 8vo., Paris, 1843, s. v., Chapelle expiatoire, one of xv cent. in the middle of the bridge of Bar sur Aube; ARNAUD, *Voy. Arch. dans le dép. de l'Aube*, 4to., Troyes, 1837-42, pl. ix. MILLIN includes a diminutive church, which according to him holds the place of the ancient *avicula*. This ranges from the canopy or niche up to the *oratorio*, as it is generally called in Italy (built in places where a sufficiently large means for a church cannot be obtained), and especially erected in thoroughfares, along which a large number are placed for the accommodation of travellers and of the rural population. As a model that by G. Barozzi da Vignola for pope Julius III, called S. Andrea Apostolo on the via Flaminia near the villa di papa Giulio III; MORONI, *Diz. Eccles.*, 8vo., Venice, 1841, s. v. Capella, p. 97.

A shrine or oratory over relics on the site of a miracle frequently comes under this head; it was often selected in after-times as the place of a monastery, or of a collegiate ecclesiastical body. *SAINTE CHAPELLE*.

WAYSIDE CROSS (Ger. *betsäule*). Heathen rites were celebrated at cross-roads, so the cross was erected to sanctify the place and purify it from the old worship. In addition to the publications named s. v. *CROSS* (p. 166), wayside; and monolithic. A perfect one exists in the township of Colne, in Yorkshire, near the ancient house of Emmott; WHITAKER, *Whalley*; new edition, 4to., 1818, p. 397. *Cornish Wayside Cross*, in EXETER ARCHITECTURAL SOCIETY, *Transactions*, 4to., Exeter, 1849, pl. 32. MUIR ("Unda"), *Old Church Arch.—of Scotland*, 4to., 1861; and *Barra Head* (1886). CUTTS, *Sep. Crosses of the Middle Ages*, 8vo., 1849; and *The Church Yard Cross*, read at INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1866-67. POOLEY, *Old Crosses of Gloucestershire*, 8vo., 1868. T. P. WHITE, *Arch. Sketches—Kintyre*, fol., Edinb., 1873. RIMMER, *Ancient Stone Crosses of England*, 75 cuts, 1875. POOLEY, *Old Stone Crosses of Somersetshire*, 8vo., 1877. OWEN, *Stone Crosses of the Vale of Clwyd and neighbouring parishes*, 4to., 1885. G. F. BROWNE, *Runic Crosses*, 8vo., Cambridge, 1888.

"Shank" (1646) was applied to the upright portion or stem. LOWER, *English Surnames*, 8vo., 1842, gives a picture of a "Crouch" as another name for a wayside cross.

WAYSIDE RAILWAY STATION. Those at Férté-Bernard (2nd class) and Evron (3rd class), on the chemin de fer de l'Ouest, by ... Baude, C.E., are given in *ANNALES DE LA CONSTRUCTION*, fol. 1855, i, pl. 19-20.

WAYTE (ROBERT), mason, 1415 at Salisbury cathedral; an indenture was drawn up between him and the dean and chapter in nearly the same terms as with his predecessor N. Portland in 1394, and with R. de Farleigh in 1334 for repairing the fabric. DODSWORTH, *Salisbury Cathedral*, fol., London, 1814, p. 151, 160.

WAY WARDEN (Lat. *via*; Fr. *voie*). A highway surveyor.

WAY WISER. A perambulator or road measuring machine. NICHOLSON, *Dict. of Architecture*, 4to. (1853), new edit.

WEAR AND TEAR. See *USE AND WEAR*. *Wear of road materials*; *Pavements and Roads*, reprinted from the *ENGINEERING AND BUILDING RECORD*, New York, and reviewed in *BUILDER ARCH. PUB. SOC.*

Journal, 1890, lix, 199-202 with Tables. *How to determine the wear of a stone*, by TICHBORNE, in *BRITISH ARCHITECT Journal*, May 24, 1889, p. 385.

WEARDE STONE QUARRY, near Gunnerslake, or Gunnis lake quarry, Calstock, in Cornwall, 1864, supplies a very durable granite for pitching, and for macadamising.

WEATHER BOARD. A board fixed at an angle of 45° (at least) in its width, and generally horizontally in its length, across a timber-built wall or gable, often in tiers, to form the drips for dryness characteristic of "the northern energy", or at the bottom of a door or window, to keep out driving rain. In Lincolnshire it is called "Wash Board". R. R. R.

WEATHER BOARDING. It is employed in covering out-houses and buildings of a temporary nature; and makes the best sides of barns, as it allows a circulation of air, and so prevents damp and mildew getting into the crops. SIDING. Feather edged boards, $\frac{3}{4}$ in., or four or six boards to a 3 in. yellow deal, nailed against the stud-work of a house, instead of lath and plastering, or other work. The thick or lower edge of one board is nailed an inch or inch and a half over the thin or upper edge of another board, so as to form a lap. "But if the work is to be a little extraordinary, they (1736) set an ogee on the thick edge of every board." Sounder work is produced by rebating the back of the thick edge of every board. "Clapboard or weather board with a feather edge, lapping one over another, and presenting a succession of horizontal lines 4 ins. apart, form the outside covering of the framed churches in Newfoundland," *ECCLESIOLOGIST Journal*, 1849, ix, 21. It has been asserted that boarding lasts longer if not covered by paint or other similar material. Where the boards are of the same thickness throughout and fixed horizontally to studs, the top front edge of each board rebated $1\frac{1}{2}$ in. and the bottom back edge rebated $\frac{1}{2}$ in.; the finished work shows grooves 1 in. wide, and is called RUSTICATED BOARDING. CLINKER BUILD. 4.

WEATHER. See *ATMOSPHERIC INFLUENCE*.

WEATHER COCK. A VANE fixed at the top of a church or other building, specially in the shape of a cock; that bird being the emblem of vigilance. "The cock at the summit of the church is a type of preachers," etc.; DURANDUS, *Symbolism of Church Ornaments*, by NEALE AND WEBB, 8vo., Leeds, 1843, p. 27. The mystical explanation attached to the symbol, is given in *ECCLESIOLOGIST Journal*, 1850, xi, 161-2, extracted from a MS. cir. 1420 preserved in the cathedral of Oehringen, and published by Edéstand du Meril; and VIOLET-LE-DUC, *Dict. Rais.*, 1859, s. v. Coq, quotes DURAND, *Rational des divins offices*. At Winchester to the cathedral 961-971, Wulstan relates how "a weathercock caught the morning sun and filled the traveller with amazement—the golden weathercock lording it over the city; up there he stands over the heads of the men of Winchester, and up in mid-air seems nobly to rule the western world; in the claw is the scepter of command, and like the all-vigilant eye of the ruler, it turns every way—" One is shown in the Bayeux tapestry on Westminster abbey. In 1444 the spire of old S. Paul's cathedral, was by bishop Kemp adorned with a copper weathercock, then a novel invention; it was 4 ft. long, 3 ft. 6 in. wide, and weighed 40 lbs.; MILMAN, *Annals of S. Paul's Cathedral*, 8vo., 1869, 2nd edition, 162. In 1515, one was set upon the spindle on the top of Holyrood house, Edinburgh, after having been hallowed, and with rejoicings. At Louth; "Thomas Taylor, draper, gave the weathercock, which was bought in York of a great baron, and made at Lincoln; and the king of the Scotts brought the same baron into England with him"; 1515, on 15th Sunday after Trinity of this year, it was hallowed and set up; *ARCHÆOLOGIA*, 4to., 1792, p. 85-6; BRITTON, *Arch. Antiq.*, 4to., 1814, iv, 4. 16 April, 1606, David Andersone, maister of kirk wark to send the brazen cok of the steppill of Sanct Nicolas parish kirk of this burght to Flandris—to be mendit thair and overgilt—and to be erectit and set vp vpon the hicht of the said steppill—; SPALDING CLUB, *Aberdeen Burgh Records*, 4to., Aberdeen, 1848, ii, 283. 1859, A box was

placed, it is stated, in the new weathercock on the spire of Notre Dame at Paris, containing various relics (*BUILDER Journal*, xvii, 448). A design is given in the *INSTRUMENTA ECCLESIASTICA*. No. 2, 1850.

MAGRI or Macri, *Hieroglyphicon*, fol., 1677. CANCELLIERI, *De Secretariis*, etc., 4to., Rome, 1786, "our veteres Christiani turribus Campanariis Gallos imponerent?" iii, p. 1363. MORONI, *Dizionario Ecclesiastico*, 8vo., Venice, 1841, vii, s.v. Campanile (at end). DUDLEY, *Natology*, 8vo., Leicester, 1846, p. 548-50. CROSNIER, *Dernier mot sur le coq superposé à la croix*, in *ICON. CHRÉTIENNE*, in DE CAUMONT, *Bulletin Monumental*, xv, 8vo., Caen, 1848. *Vane and Weathercock of London Churches*, *BUILDER Journal*, 1855, xiii, 123. HORE, *On Vane and Weathercocks*, in *THE ANTIQUARY*; and *BRITISH ARCHITECT Journal*, 4 May 1888, p. 329. AUBER, *Histoire, etc., du Symbolisme Relig.*, 8vo., Paris, 1871, iii, 117. STARKIE GARDNER, *Wrought Iron Work*, read at ROY. INST. OF BRIT. ARCHITECTS, 16 Feb. 1891.

WEATHER DOOR. The name for the small openings in the spire of churches; PRICE, *Salisbury Cathedral*, 4to., 1753, pl. 9.

WEATHER MOLDING. A molding projecting from the face of a wall to cast off wet. A CORNICE is a succession of projections for the same purpose. WILLIS, *Nomenclature*, 4to., Cambridge, 1844, p. 51, states that this term is applied by RICKMAN to the molding which crowns an opening, which is objectionable, but "no ancient term has been preserved for it, except perhaps hoodmold". LABEL. CANOPY. HOODMOULD. WEATHER TABLE. WATER TABLE. DRIPSTONE.

WEATHER STONE. A bed of stone that among the several beds in the same quarry stands the weather best; as Box ground quarry at Bath. WELDON quarry supplies a better weather stone. KETTON STONE.

WEATHER TABLE. See OFFSET; SET-OFF; WATER TABLE.

WEATHER TIGHT. See WATER BAR. WATER TIGHT.

WEATHER TILE. The tiling, or covering to the upright sides of a house to prevent wet being driven through thin brickwork; quoins should be protected by specially made angle tiles to bond with the others. Slate is often used for this purpose. Hall's patent hanging tiles, imitate a face of white glazed bricks. 4.

WEAVING SHED. Looms occupy various spaces according to whether they are "broad" or "narrow". The average narrow loom is 5 ft. wide by 8 ft. 8 ins. long; and the average broad loom is 5 ft. 8 ins. wide by 16 ft. 4 ins. long. It is customary to allow from 18 ins. to 24 ins. for a pass between the looms, coming usually where the pillars may occur in the shed. The walking passage down the middle is wider, and there are usually three ranges of looms on each side of it. The light should be arranged to fall on the work. The height of the shed varies from 15 ft. 6 ins. to 17 ft. 6 ins. THWAITE, *Our Factories, Workshops, and Warehouses*, 8vo., 1882. A flax mill for Marshall & Co. at Leeds, of one room 396 ft. long, by 216 ft. wide, the roof of brick groined arches 21 ft. high and 36 ft. span; by J. Combe; INST. OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1842, ii, 142. The long longitudinal threads are the warp, the cross ones the weft.

WEB. The iron plate, fixed vertically, in a single web girder; or two plates in a tubular girder. It is seldom made less than $\frac{3}{16}$ ths inch, and except for the largest beams, this is generally more than sufficient to resist the shearing stress. As it has little or nothing to do with the pressure directly, it has been replaced in some cases by simple upright struts or diagonal braces. Many engineers believe in the weakness of the OPEN WEB GIRDER, compared with its older and solid-sided rival, considering that the element of strength is to be found in the "mass", as the opinion pronounced twenty years ago, on the relative merits of the two systems, since proved to be erroneous. HEPPEL, *On the relative proportions of the top, bottom, and middle Webs of iron girders and tubes*, at INST. OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1856, xv, 155-94. 1.

WEBB. An old weight of lead. 1561, "Note; ther is xvij webbz of leade uppon a syde of this roufe, which I est. to be ij fother or thearaboute;" RAINE, *Description of the Episcopal palace at Howden*, in ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1866, p. 298; a webb "contained in length iij^{xx} yards and in bredth one yarde, . . . to the value of xxli" (p. 301) = to about 2s. 3d. per foot super. WEB of iron.

WEBB (.....), of Staffordshire, about 1814 designed Warleigh house, Somersetshire (Gothic), for Henry Skrine, esq.; and alterations, etc., at Somerford Booth's hall, Cheshire, for C. Swetenham, esq.; both in NEALE, *Seats*, 4to., 1824, 2nd ser., i.

WEBB (JOHN), born in 1611, attended Merchant Taylors' school till 1628, and became a pupil of I. Jones, who *cir.* 1629 laid out Great Queen street, Lincoln's Inn fields; the large brick house with lions' heads on the pilasters, on the south side, was designed 1640-50 by Webb (not by ... Mills as stated by VERTUE), for whom is not known. Also designed (not executed) a large house on the site of Durham house, Strand, for Philip Herbert, earl of Pembroke and Montgomery (died Jany. 23, 1649-50); the elevation is in the collection of Jones's drawings at Worcester college, Oxford; WHEATLEY, *London, Past and Present*, 8vo., 1891, i, 542. In 1648, he rebuilt the side of Wilton house, Wiltshire, built 1633 by S. de Caus, and burnt 1640; NEALE, *Seats*, v, states it was commenced by Caus in 1640 and was rebuilt from the designs of Inigo Jones. Also 1656 Thorpe, or Longthorpe, hall, near Peterborough, for Oliver S. John, built out of the ruins of the bishop's palace and cloister; CAMDEN SOCIETY, *M. Rawdon of York*, 4to., 1863, p. 114; EVELYN, *Diary*, Sept. 1654; HAKEWILL, *Thorpe Hall*, fol., 1852. He painted the scenes for the drama at Rutland house, Aldersgate street, 1656 revived under sir William Davenant; WHEATLEY, *London, Past and Present*, 8vo., 1891, ii, 196.

In June (?) 1660, occurs a Petition of J. Webb, architect, to the king for the place of surveyor of works, designed for him by the late king, being brought up under Inigo Jones in the study of architecture, and appointed his deputy till thrust out for loyalty in 1643; is now, by instructions of parliament, preparing a survey of his majesty's houses for his reception, the cost of which will be £8,140 5s. 2d. for which he is engaged in credit, having received only £500. Annexing arguments, that under his uncle I. Jones, he not only studied architecture, but masques and triumphs; was his deputy and executor, and has £1,500 due to him on Jones' board wages. He sent to the king at Oxford designs of all the fortifications in London, with instructions how they might be carried; prepared Whitehall in a fortnight for his majesty on his own credit; and though Mr. Denham may, as most gentry, have some knowledge of the theory of architecture, he can have none of the practice, but must employ another, whereas Webb has spent thirty years in it and worked for most of the nobility. Grant to J. Webb in reversion after J. Denham of the office of surveyor of the works; *Calendars* (Domestic Series), 1660-1, p. 76. He however did not obtain the appointment, as C. (sir C.) Wren succeeded to Denham on his death in March 1668-9. In 1660 he sold to Henry Carter of London, a naked Venus a foot long for £20, said to have belonged to the monarch; *idem*, p. 379. 1661-6 sir John Denham set about the rebuilding of the palace at Greenwich; EVELYN, *Diary*, 19 Oct. 1661; 24 January 1661-2. This portion erected from the design of Inigo Jones (died 1652; *Gwynn, London and Westmr. improved*, 4to., 1766, p. 118), was introduced by sir C. Wren into the general arrangement of the hospital, and forms the west side of the great square of the river front. The order for "John Webb of Butleigh, co. Somerset", to act as surveyor assistant to sir J. Denham, is dated February 28, or November 24, 1666, with £200 per annum, as Denham has, and travelling charges (of £1 13s. 10d. per month), to be paid monthly, beginning from January 1664; *Calendars*, Domestic Series, p. 286; and 1667, 8vo., 1866, p. 60; 153 (latest volume published). SHAKESPEARE SOCIETY, *Life of*

I. Jones, 8vo., 1848, p. 34, 38, 48. This "new building" was incomplete at March 1668-9. CAMPBELL, *Vitr. Britt.*, fol., 1715, i, pl. 31; and iii, pl. 1.

Webb 1661 continued Amesbury or Ambresbury, Wiltshire, for lord Carleton; on Jones's work of 1654: CAMPBELL, *Vitruvius Britannicus*, fol., 1725, iii, pl. 7; about 1836, T. Hopper destroyed the refectory, etc., and left a four-centred Gothic arch (in cellar?), and pulled down the four-columned portico, erecting one of six; the saloon with a large cove was pulled down during alterations under J. J. Cole, before those of 1853. Webb 1663 designed Gunnersbury house, Ealing, for serjeant Maynard; also from the designs of I. Jones: it was occupied by Henry Furnesse, esq. (DODSLEY, *London*, etc., 8vo., 1761, iii, 110, with view); and 1801 by Mr. Morley, who sold it to Alex. Copeland, who built another house for his own residence on part of the site; he died 12 July 1834; and the old house was purchased by baroness Rothschild, who retaining the saloon, *cir.* 1834 had the house rebuilt under S. Smirke, R.A.: CAMPBELL, *Vitruvius Britt.*, fol., 1717, i, pl. 17-8; FAULKNER, *Brentford*, etc., 8vo., 1845, p. 255; a good description of the old house in 1787 is given; ILLUSTRATED LONDON NEWS, 1845, vii, 406. After April 18th, 1663, sir John Denham with John Webb his assistant, would not accept of wages "for new making the hip of the south end of the roof" of S. Paul's cathedral; with other works of restoration; MALCOLM, *Londinium Redivivum*, 4to., 1803, iii, 83. 1664-5-6 he designed Burlington house, Piccadilly, with sir J. Denham, for Charles the father of Richard Boyle, earl of Burlington, the latter entirely remodelled it about 1720; CAMPBELL, *Vit. Brit.*, fol., 1725, iii, pl. 91-2; LYSONS, *Magna Britt.*, 4to., 1808, p. 217. 1673 at The Vine, near Basingstoke, the portico with many alterations, for Chaloner Chute, the speaker: the interior was remodelled by his son John Chute who put up the staircase from his own designs; he died 1766; ACKERMANN, *Repository of Arts*, etc., 3rd series, 1826, vi, 188. Also the following works to which dates have not been assigned: ... Bedford house, Bloomsbury square, for Thomas Wriothesley, earl of Southampton, perhaps from Jones's design. ... Lamport hall, Northamptonshire, for the Isham family; the front towards the road; that to the village was the old Elizabethan front. ... Ramsbury manor, Wiltshire (Wren style), for sir William Jones; NEALE, *Seats*, 4to., 1822, v. ... Ashdown park, Berkshire, is attributed to Webb: who is now considered to have carried out *cir.* 1640 (query too early) Ashburnham house, Dean's yard, Westminster, from the design of Jones; *Society for photographing relics of Old London*, 1882.

Talman had a quarto volume of capitals and ornaments of architecture, in indian ink, designed by Webb for several houses. Webb designed the frontispiece to WALTON, *Polyglot Bible*, fol., 1657, edited by Hollar; and edited *The most notable antiquity called Stone-Heng*, by I. Jones, fol., 1655; wrote *Vindication of Stone-Heng restored*, fol., 1665; and fol., 1725, 2nd edit. The edition of "Serlio", fol., 1619 (now in the library of the roy. inst. of British architects), has an endorsement on p. 2 of Book vii, "Theeving Lane, Jan. 16, 1643," possibly in his or Jones's fine handwriting to whom the volume is said to have belonged. He died 24 October 1672, aged 61, at Butleigh and was buried in an aisle of the church there. He married a kinswoman of I. Jones, which is the only relationship apparently (see "uncle" in petition of 1660, but is it in the original?); A. WOOD, *Athenae Oxoniensis*, 4to., 1813-20, iii, 806, says Webb "married his niece"; and iv, 753-4, calls Webb "the husband of the daughter of I. J. his cousin-german", into whose hands the greater part of Jones's papers came (he died 1652), and Webb was his executor. Webb's son, James, also lived at Butleigh. WALPOLE, *Anecdotes*. W. F.

WEBB (W...), a pupil of sir R. Smirke, R.A., who on his

recommendation 1823-6 acted as clerk of the works at the new courts at Lincoln, and became county surveyor and accountant for all matters connected with the castle. He had been previously in the service of the board of ordnance, and was sent to S. Helena to erect the house intended for Napoleon Bonaparte, but which he refused to inhabit; *Guide to the Cathedral*, 12mo., 1840, p. 51.

WEBBE (JOHN), designed before 1807 Wanstead grove, Essex, for the hon. Anne Rushout; NEALE, *Seats*, 4to., 1826, 2nd ser., iii.

WEBSTER (THOMAS), born in the Orkneys, was bred an architect, but by circumstances and from taste he acquired proficiency as an artist, a geologist, and natural philosopher. In 1800 he assisted B. Thomson, count Rumford (revised by G. Sanders, or J. SPILLER, or 1809 John Crake), in the design of the theatre, repository, and library of the royal Institution, Albemarle street; of which there are original sketches in the library of the ROY. INST. OF BRIT. ARCHITECTS. H. B. JONES, *The Royal Institution; its founders*, etc., 8vo., 1871: BUILDER *Journal*, 1847, v, 115. He died 26 December 1844, aged 72, and was buried in Highgate cemetery; CANSICK, *Highgate Cemetery*, 8vo., 1872, p. 20.

WEBSTER (...), of Kendal, 1818-25 designed Read hall, Lancashire, for Rd. Fort, esq.; BURKE, *Visitatio*, 8vo., 1855, ii, 169; and 1825-27 Eshton hall, Yorkshire, (Tudor) for Matthew Wilson, esq.; NEALE, *Seats*, etc., 4to., 1829, 2nd ser., v.

WECKERLIN (JOHANNIS). A tombstone in the transept of the dome at Mainz, xv cent., is inscribed "Hic est sepulchra magister J. W. ac uxoris et parentum nec non omnium progenitorum suorum lapicidarum hujus ecclesiae". 92.

WEDALE and WEDDALE (sir ROBERT), 1434-37 was master fabricer of the king's palace at Litchfield, with Robert of Livingston; J. Weir in 1351; BANNATYNE CLUB, *Accounts of Great Chamberlain*, 4to., Edinb., 1817, iii, 201-2, 324, 369-70. ROBERTSON, in ARCH. INST. OF SCOTLAND, *Transactions*, 4to., 1851, i, 55-67. BUILDER *Journal*, 1851, ix, 53.

WEDDING DOOR. This was usually on the south side of the church. 1559-60, for mendynge and fastening window over the wedinge church door, *vis. vii*; in this church it seems the door was on the north side and evidently not the porch; CAMDEN SOCIETY, *Accounts of Town of Ludlow*, 4to., 1869, p. 97-8. *Wedding Stone*, in *Archæologia*, ii, 359; xxv, 54.

WEDDING HOUSE. One, at Braughing in Hertfordshire, near the churchyard, was a house appropriated for celebrating the weddings of the poor, a kitchen, hall, and a lodging room, with bridal bed and linen; TYMMS, *Family Topographer*, 12mo., 1832, i, 46. A "dower house" was provided in noble families for the residence of the wife on becoming a widow. "Not far from Burleigh in Northamptonshire, is the much smaller, but still notable house, at Wothorpe, the dower house of the Burghleys, and built about 1600 by Thomas Cecil, the son of the Cecil who 1569 built Burleigh; he built it, as he jestingly said, 'only to retire to out of the dust while his great house of Burghley was a-sweeping'; it was dismantled in 1759"; GOTCH, *The Renaissance*, etc., in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1890, new series, vi, 91.

WEDDING PORCH. In the will of Henry VI it is directed that there should be "in the south side of the body of the church of Eton College a fair large dore with a porche, and the same for christenings of children and weddinges". At the south entrance of Norwich cathedral, a "marriage" is noticeable as carved in stone.

WEDGE (Fr. *coin*; *clef*). In mechanics; a solid piece of wood or metal, generally made in the form of a triangle prism, of which the two ends or bases are equal, and similar plane triangles, and the three sides rectangular parallelograms, and it is called rectangular, isosceles, or scalene, according as its equal and similar bases are composed of right angles, isosceles, or scalene triangles. As a mechanical power, the wedge performs its office, sometimes in raising heavy bodies, but more

often in dividing or cleaving them. The axe, chisel, spade, and other such instruments are wedges. A LEWIS is an inverted wedge. The use of sandbags in lieu of wedges: "Nouveau procédé de décentrement pour les voutes et les arcs de grande portée," in DALY, *Revue Générale*, 1854, xii, 303. VIOLETT-LE-DUC, *Dict.*, ii, 422. PLUG AND FEATHER. SHOULDER WEDGE. KEY and diagram. SAND BAG. TENON. GWILT in translation of VITRUVIUS, 8vo., 1826, vi, 11, uses the word "wedge" probably for the voussoir of an arch; INCUMBA. 1. 14.

WEDGE-SHAPED STONE. See VOUSSOIR.

WEDGE UP (Fr. *accorer*). To put a wedge between two stones to get them level and fill in with cement; or to fasten a tenon in a mortise (Fr. *caler*). The wedges and wedging up of rails in the chairs of a permanent way, by J. Pope, at INSR. OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1842, ii, 72-80. Thanks were voted to T. Wicksteed for experiments on the application of wooden wedges to secure the joints of water-pipes; SOCIETY OF ARTS, *Transactions*, 8vo., 1837, li, pt. 2, p. 90. UNDERPIN.

WEEM. See PICTS' HOUSE.

WEENINK (mynheer JEAN BAPTISTE), born 16 November 1790 at Paris, of a Dutch family who returned to Amsterdam in 1792; he studied under J. Thibault. In 1809 he went to Paris and studied under ... Le Bas and Debret. From 1823 he was director of the drawing academy at the Hague. He died before 5 May 1856. 24.

WEENINX (JAN), practised with much credit at the beginning of XVII cent. at Amsterdam. He died in 1662; his son Jan Baptist, born 1621, became an eminent painter particularly of dead game (died 1660), and had a son born 1644 equally eminent (died 1719). 14.

WEEPER. The little IMAGE in an attitude of mourning, in niches on the side of an altar tomb under housings. Agreements for the tomb of the earl of Warwick, in Beauchamp chapel; BRITTON, *Arch. Antiqs.*, 4to., 1814, iv, 13. 19.

WEEVIL. An insect which infests barns and granaries having damp walls. CURTIS, F.L.S., *Farm Insects*, 8vo., Glasgow, 1860; 2nd edit., 1883. The adoption of means to insure dryness will prevent the generation of the insect, and destroy it if generated. VITRUVIUS, vi, 9, states that if the granary be towards the south or west, "the weevil or other insects injurious to corn will be generated." This insect rapidly destroys corks in wine-cellars; the only real prevention is to cover each cork entirely by dipping into molten sealing-wax.

WEFFELSBURG (Anc. AVENTICUM), also called Avenches, in the canton of Vaud in Switzerland. G. L. SCHMIDT, *Recueil d'Antiq.*, 4to., Berne, 1760, 25 pl.

WEGMANN (GUSTAV ALBERT), born 1812 at Zurich, became a pupil of the baumeister Volkaert. In 1831 he worked as a mason on the palace of the ministry of finance, at Carlsruhe, designed by Hübsch; became a favourite pupil of his while at the polytechnic school, and was, 1834, entrusted by him with the building of the conservatory of the botanic gardens at Heidelberg. In 1835 he went to Munich and studied under Gaertner; where he made a design for the cantonal school in Zurich, which was premiated, and carried out by him in 1838-42; at the same time with his colleague Zeugherr he built the hospital there, which is highly praised by medical men; the façade is 1,200 ft. long, and was finished 1842. FÜESLI, *Zurich u. die wichtigsten Städte am Rhein*, 8vo., Zurich, 1842-3, i, 81. 68.

WEHELIN (meister), nearly finished the nave of Strassburg cathedral dating in early part of XIII cent.; it was completed 1275 or 77 perhaps by Erwin von Steinbach.

WEHNERT (FREDERICK), born 1801, was a pupil of W. F. Pocock, *cir.* 1830 visited France and Germany; became principal assistant to S. W. Daukes in designing the Colney Hatch asylum; then went into Scott and Moffatt's office where he met J. Ashdown and commenced practice as partners Feb. 24, 1852. They planned the Maitland park estate of the

Orphan Working school, Haverstock hill, and designed most of the villas; 1853 the Crystal palace hotel at Annerley; 1854 laid out the cemetery of the Lambeth burial-board at Tooting; 1854 formed extensive additions to the Highgate cemetery, the chapel, and the tunnel under the road; 1853 obtained the first premium for Trinity new church and parsonage at Tulse hill, but not executed by them; carried out the planning of the Bennett park estate, Blackheath; 1853 transformed the farmhouse at Dunford, Midhurst, Sussex, for R. Cobden, M.P., into a mansion; designed Ercall vicarage, Shropshire, for rev. R. T. Forester; laid out Cottenham park estate at Wimbledon, for Dr. Finch; from 1854 laid out Llandudno, North Wales, for lord Mostyn, with designing there many mansions and public buildings and the public baths, the Pwllheli schools, Calvinistic chapel, bank, library, etc.: and 1856 six houses in Anderson's buildings, City road. The partners then separated, Wehnert in 1857 taking the Milford improvements under col. Greville. Among their pupils were J. D. Hayton, W. F. Potter, C. Foulsham, R. E. Tyler, and H. T. Freshwater. E. H. and Alfred Wehnert, artists, were his brothers. He died in November 1871, aged 70. BUILDING NEWS *Journal*, 1871, xxi, 347-8. He began exhibiting at the royal academy in 1822, but his executed works with Ashdown commenced 1853.

WEIGEL (ERHARD), born 1625, was professor of mathematics at the university of Jena and an oberbaudirektor at Sachsen-Weimar. He designed for himself a house at Jena; also 1656 the front portion of the collegium at Jena; and the observatory. He died 1699. 68.

WEIDEMANN (.....), of Prussia, was the last of three masters of H. G. Wenceslaus, baron von Knobelsdorf. 68.

WEIGHT. King Edgar 959-975, enacted "Let one weight and one measure be used in all England after the standard of London and Winchester". Those at present employed in Great Britain were fixed by an act of parliament passed in 1824-5, 5th and 6th George IV, which came into force 1 Jan. 1826. The troy pound was destroyed in the fire of the Houses of parliament, but the act 18th and 19th Victoria, c. 72, legalised and preserved the restored standards; CHUSHOLM, *Report on the Exchequer Standards of Weights and Measures*, 1864. The act 4th and 5th William IV, cap. 49, declares that the stone was to consist of 14 standard pounds avoirdupois; the hundred shall consist of 8 such stones, and the ton of 20 such hundredweights. All weights shall be stamped, and no pewter ones to be used; BUILDER *Journal*, 1863, xxi, 77. "The Weights and Measures Act 1889," is illustrated in *Model Regulations with respect to Inspectors and the inspection of weights, measures, etc.*, issued by the Board of Trade, published by Eyre and Spottiswoode.

Troy Weight.

| | | |
|-----------|---|---------------|
| 24 grains | = | 1 pennyweight |
| 480 " | = | 20 " |
| 5,760 " | = | 240 " |
| | = | 12 " 1 pound |

This is the most ancient English weight.

Avoirdupois Weight.

| | | |
|-----------|---|-----------------------------------|
| 16 drams | = | 1 ounce |
| 256 " | = | 16 " 1 pound |
| 7,168 " | = | 448 " 28 " 1 quarter. |
| 28,672 " | = | 1,792 " 112 " 4 " 1 cwt. or hund. |
| 573,440 " | = | 35,840 " 2,240 " 80 " 20 " 1 ton. |

This weight was introduced in the reign of Henry VIII.

Apothecaries Weight.

| | | |
|-----------|---|--------------------------|
| 20 grains | = | 1 scruple |
| 60 " | = | 3 " 1 dram |
| 480 " | = | 24 " 8 " 1 ounce |
| 5,760 " | = | 288 " 96 " 12 " 1 pound. |

Used in compounding medicines, but the simple drugs are bought and sold by Avoirdupois weight.

Wool Weight.

| | | |
|---------|---|---|
| 7 lbs. | = | 1 clove, i.e., cloves or nails (The Pathway). |
| 14 " | = | 2 " 1 stone |
| 28 " | = | 4 " 2 " 1 tod |
| 282 " | = | 26 " 13 " 6½ " 1 wey (WAVE and WAY). |
| 364 " | = | 52 " 26 " 13 " 2 " 1 sack |
| 4,368 " | = | 624 " 312 " 156 " 24 " 12 " 1 last |

A pint of pure water weighs a pound and a quarter. WATER.

To find the weight of a material: 1. Multiply the cubic inches by the specific gravity of the material and divide the product by 1.728 and the quotient will be the number of *ounces* avoirdupois. 2. Multiply the cubic inches as before and divide by 27.648 and the quotient will be *pounds* avoirdupois. 3. Or the cubic *feet*, and divide by .016, and the quotient will be *pounds* avoirdupois. 4. Or the cubic *feet*, and divide by 35.8, and the quotient will be *tons*. BEVAN, in *MECHANICS' MAGAZINE*, January 1, 1823. To find the weight of lead, glass, etc., without weighing them, is given in *BUILDER Journal*, 1860, xviii, 401.

Weights of materials: some others under MEASURES. 1. 14.

AIRY, *Extracts—commission appointed for the restoration of the Standards*, 4to., 1840.

BEARDMORE, *Hydraulic Tables*, 1852, p. 19-20.

GRANDY, *Timber Importers', etc., Guide* (brick, etc., goods), 8vo., 1865, 126-7.

MOLISWORTH, *Engineering Formulae*, 12mo., 1865.

PEDDIE, *Practical Measurer*, 8vo., Glasgow, 1862, p. 3-4.

GREGORY, *Mathematics for Practical Men*, 8vo., 1862, p. 80-2.

MALPAS, *Builders' Pocket Book* (building materials), 18mo., 1852, p. 102.

OVERMAN, *Mechanics* (metals, water, substances), 8vo., Phil., 1861, p. 417.

PAPERS OF CORPS OF ROYAL ENGINEERS (articles of traffic, packages), 8vo., Ser. 1, iii, 192.

C. H. SMITH, *Building Stones*, in HUNT, *Memoirs of the Geological Survey, Mineral Statistics*, 1858, pt. 2, 8vo., 1860, p. 131.

The Hay and Cattle Measurer (stacks, cattle, local weights), 8vo.

RANKINE, *Manual of Civil Engineering* (materials), 8vo., 1864, p. 317; 348.

RYDE, *Pocket Companion* (articles, bulk), 12mo., 1842, p. 545; 547.

LANGLEY, *Builder's Complete Assistant*, 8vo., 3rd edit., 1738, p. 24.

FENWICK, *Mechanics of Construction* (materials), 8vo., 1861, p. 13.

AIDE MÉMOIRE, 8vo., London, 1845-52 (forage), i, 544.

GUTTERIDGE, KATFEL, KELLY, PALAISEAU, WARE, BAILY, CLARK, GRAHAM, CLELAND (Scotland), RONDELET, CORDIER, TAYLOR.

HOLTSCH, *Griech. u. Römische Metrologie*, Berlin, 1878.

YATES, *On the French System of Measures, Weights, and Coins*, 1854.

MORIN, *Aide Mémoire*, (Foreign and English), 8vo., Paris, 1864, 5th edit.

ENCYCLOPEDIA BRITANNICA, W. and M., 4to., xxiv, 1888.

HURST, *Architectural Surveyors' Handbook*, 12mo., 1865. YOUNG, in Spon's *Archts. and Builders' Pocket-book of Prices* (foreign weights as compared with English weights), 12mo., 1876; and 1891. WATERLOW and LAYTON, *Surveyors', etc., Diary*, 8vo., 1880, p. 63. LAXTON, *Builders' Price Book for 1862* (materials), p. 8. *Engineers', Architect's, and Contractor's Pocket Book*, for 1861 (Lockwood), p. 175 et seq.; metals, 144-7; 196; 202; woods, 127; weights, 143; 337-9.

WEIGHT. See MÈTRE. MEASURE. CRUSHING WEIGHT (with tables). FLOOR (load on a). GRAVITY (and table). LOAD (with table). PARTITION. ROOF COVERING (weights of). WILLIS, *Effects produced by causing weights to travel over elastic bars*, in BARLOW, *Strength of Timber*, 8vo., 1851, 2nd edit.

WEIGHT. To raise a weight. See HOIST. LIFT. MOVING. PERPENDICULAR. RAISING.

WEIGHTS of a sash. The cast-iron or lead weights used to balance the sashes of a window. They should amount to half a pound more than the weight of the top sash, and to half a pound less than the bottom sash. SASH. SASH WEIGHT. 1.

WEIGHTMAN (JOHN GRAY), born 1801 at Bawtry, Yorkshire, was articled to Woodhead and Hurst of Doncaster, and studied under C. R. Cockerell and sir C. Barry. He settled at Sheffield in 1833 and designed the collegiate school there. In 1838 he entered into partnership with M. E. Hadfield, and measured many of the south Yorkshire, Lincolnshire, and Nottinghamshire buildings of the XIV-XVI centuries. 1845-54. they restored the nave and central tower of Howden minster; designed 1844-48 the R. C. cathedral of S. John at Salford; 1845-8 S. Chad's church, Chetham Hill road; S. Marie's church, Mulberry street, with other R. C. churches in Manchester and neighbourhood, and 1846-50 the R. C. church of S. Marie, Norfolk row, Sheffield, based on Heckington and other Lincolnshire churches. They also designed the Sheffield markets for the Duke of Norfolk; and several churches and mansions in North Wales. In 1850 G. Goldie, a pupil, was taken into partnership; C. Hadfield was another pupil. The Leeming and ARCH. PUB. SOC.

Lee chantries and stalls in S. John's R. C. church, were published in *A Series of Executed Examples of Ecclesiastical and Domestic Structures, from the Designs of Modern Architects*, 4to., London, 1858. The partnership terminated in 1859, after which Weightman designed messrs. J. Rodgers and sons' warehouses and showrooms at Sheffield. He died in 1872 at South Collingham, Nottinghamshire. c. II.

WEIMAR (Lat. *Vimaria*). The capital of the grand duchy of Saxe-Weimar, situate on the river Ilm, over which are two bridges, the one of stone *cir.* 1613 by H. Hofman (1720 by C. Richter at Ober-Weimar). There are six gates, remnants of the walls, and forts; and the mediaeval castle restored 1856-57 under ... von Rütger. Theschloss or ducal palace dates 1789-1803. The stadt or hauptkirche, 1400, has two towers and was restored 1733-35 by C. Richter; it has a good altarpiece by L. Cranach (died 1553); forty-four members of the ducal family are buried in the church; also Herder, to whom a bronze statue by Schaller is in front of the building. The S. James or garrison church. The *rathhaus* (Gothic) 1841; the *reithaus*; grand ducal library of over 140,000 volumes; workhouse; museum 1869, renaissance; theatre 1774 by N. F. von Thourer, and J. F. Steiner worked on it; rebuilt 1825; hospital; new stabling; deaf and dumb institution; the houses of Goethe (died 1832) and of Schiller (died 1805), their statues set up 1857 were by Rietschel and cast at Munich; the equestrian statue 1875 of the grand duke Carl August, is by Donnerdorf; that of Wieland is by Gasser. Plan in GRANVILLE, *S. Petersburg*, 8vo., 1835, i, 206. WETTENS, *Weimar am O.* 14. 28. 50. 96.

WEINBRENNER (FRIEDRICH), born 9 November 1766 at Carlsruhe, son of a carpenter and builder, studied irregularly, and 1788 commenced his *wandrerjahre* at Zurich, where he was for some time engaged on timber erections, went to Vienna where he studied at the academy, to Dresden, and Berlin where he met the brothers Genelli, who urged him to visit Italy, and he set out June 1792 for Rome with Carstens and the artist Cabot. He there taught architecture, and after a visit to Naples he in 1797 left for Carlsruhe, where he was at once appointed *bau-inspector*, designed the new synagogue, and some private mansions;—but not being sufficiently employed, he in 1799 went to Strassburg, where he 1800 designed the monument to general Desaix, erected by the army of the Rhine, on the île des épis, near the city, Ohmacht being the sculptor (GOURLIER and others, *Choix d'édifices*, fol., Paris, 1845-50, iii, pl. 308); and to general Beaupuy at Neubreisach; also a *projet* for one at Bordeaux, and another at Strassburg; was 1801 invited to Hanover where he inspected and improved the prisons for prince Augustus, and finally settled at Carlsruhe, where he designed the Catholic church; 1807 the Lutheran church; 1807-8 theatre (altered by Shlick; burnt 1847; *LITERARY GAZETTE*, 1854, p. 726; *ILLUSTRATED LONDON NEWS*, 1847, x, 162, 180); the Ettlinger gate, Standeshaus museum, the old barracks, the mint, Hochberg palace, the garden palace of the margravine Friedrich. He succeeded Müller as *oberbaudirektor* of the territory of Baden, where 1824 he designed the conversations-haus or assembly rooms, one of the most splendid in Germany; baths (neue trinkhalle 1842); antiquitäten-halle or museum, etc.; Leopold summer palace; several private houses; and smaller buildings. Numerous churches, mansions, villas, etc., within the territory, also at Leipzig, Strassburg, Göttingen, Düsseldorf, and other places. He founded a school of architecture under his tuition, much visited by students from all parts of Germany; and for them wrote the *Lehrbuch*, i, 1811, and ii, 1817, iii being in MS. when he died. He also wrote *Ueber Theater in architektonischer Hinsicht*, Tübingen, 1809; "Movable Theatres" was translated into French by C. Winckler for the *MAGAZIN ENCYCLOPÉDIQUE*; *Zeichnungslehre*, 1810; *Optik*, 1811; *Perspectivlehre*, 1817-24; *Ueber Form und Schönheit*, 1819; *Ueber architektonische Verzierungen*, 1820; *Entwürfe und Ergänzungen antiker Gebäude*, 2 vols. and text, 1822; and others, besides a variety of papers in the "Morgenblatt" and other journals. His

restorations displaying much merit, of several buildings in Rome were engraved. Among his pupils were H. Hübsch *cir.* 1813; F. Heger 1810-13; A. de Chateauneuf 1818-20; G. Moller; Heiss of Carlsruhe. He died March 1st, 1826, suddenly. His autobiography was edited by Aloys SCHREIBER, with appendix, Heidelberg 1829; who also edited *Ausgeführte und projectirte Gebäude*, 7 parts, 1830-34. HUBSCH, *Sein Leben und seine Werke*, 8vo., 1864, p. 3, 21, 40-1. 14. 68.

WEINERT (CARL FRIEDRICH), born 1750 at Grosshain, was a pupil of J. S. Locke of Dresden. In 1775 he went to Warsaw, where he designed many palaces and country houses. Returning 1785 to Dresden he was appointed royal general-accis-baudirektor; and died 1814. 68.

WEINLIG (CHRISTIAN TRAUGOTT), born 1739 at Dresden, studied under *oberlandbaumeister* Schwartz; and was already *hofbaumeister* in 1766 when he went to France to study under Le Roy, Chalgrin, and Blondel; thence went to Rome where he was welcomed by Winckelmann. He published *Letters from Rome*, 4to., 1781-87, in three volumes, with plates. He strove to root out the taste for "schnörkel-decoration", and was the first architect in Saxony to show purity of taste and the antique arabesque in external as well as internal decoration. He published *Oeuvres d'Architecture*, 3 pts., fol., Dresden, 1784-5. He became a member of the academy of Vienna 1771; *hofbaumeister* 1793; and *oberlandbaumeister* 1799, in which year he died. 68.

WEIR and WEAR (Fr. *barrage*). A DAM. An erection carried across a river or rivulet for the purpose of damming up the water for the convenience of irrigation and other uses. It is formed of stone and brick, and of timber. A single frame is properly speaking a "sluice"; it requires a series to constitute a weir. The bursting of one at Manchester is described in *BUILDER Journal*, 1849, vii, 502a; the failure in 1864 of that at Bradfield of the Sheffield reservoir, *idem*, xxii, and ILLUSTRATED LONDON NEWS; and 1853 of the Bilberry reservoir at Holmfirth, in *B. J.*, x.

WASTE WEIR. A "cut" constructed through the side of a canal, for carrying off any surplus water that may not be required for the navigation at certain times and seasons, thus operating as a drain. The water escapes into the cut, and hatches or stop-planks are fixed in the wall to dam it off when necessary. The channels in a wall of a lock for letting in the water from the upper pond into the lock chamber, are called "side culverts". AIDE MÉMOIRE, 8vo., 1852, iii, 295. WATER STORAGE. BUND. 14.

WEIR (JOHN), 1451 *magister fabricæ* of the king's palace at Linlithgow, after sir R. of Wedale; BANNATYNE CLUB, *Account of Great Chamberlain*, 4to., Edinb., 1817, iii, p. 521. ROBERTSON, in ARCH. INST. OF SCOTLAND, *Transactions*, etc., 1851, i, 60. *BUILDER Journal*, 1851, ix, 53.

WEISSENBURG or Stuhlweissenburg, and Karlsburg (Lat. Apulum; Alba Giulia, regia, Carolina, Julia, or regalis). The capital of a province of the same name in Transylvania. Many Roman works are dug up. It was founded by king Stephen (died 1038), and was for 500 years the place for the coronation, and for the burial of many, of the kings down to 1540. It was made the see of a bishop in 1772. The cathedral dedicated to S. Michael archangel dating from Stephen I, was restored before 1856; the coronation church of Maria himmelfahrt, is of the same date; as is that of the Knights of S. John, finished by Bela III; and others. The episcopal palace; the extensive *comitibus*; with the palace of count Schindegge now the post-office; coffee-house and assembly rooms; are noticed as the chief buildings. THIELE, *Das Königreich Ungarn*. JENNY, *Handbuch für Reisende*. 14. 26. 28. 50. 96.

WEISSENFELS (PETER VON), about 1500 executed the restoration of the nave and rebuilding of the choir of the Romanesque church at Freiburg, on the river Unstrut in Saxony. 92.

WELCH (EDWARD) born 1806 at Overton, Flintshire. He

became a partner with J. Hansom, and together 1832-5 designed the town hall at Birmingham (account with plans in LONDON, *Arch. Mag.*, 8vo., 1835, ii, 16-27; iii, 431, roof; ILL. LONDON NEWS, 1846, ix, 136, gives a large view of the interior); S. John's church, Toxteth park, Liverpool; the Beaumaris county gaol, with the terrace and the Bulkeley arms hotel; a church at Hull; the dispensary at York; King William's college, and several churches in the Isle of Man. He designed the northern hospital at Liverpool, with several churches in and around the city; and the Monks' ferry hotel at Birkenhead. In 1865 he patented a system for the ventilation and heating of houses by a hot-air chamber behind the ordinary firegrate, applied at the S. Pancras relief office, designed by E. C. Robins; and three rooms were warmed by one grate at a house at Godstone. He died 3rd August 1868, aged 62, in Southampton street, Bloomsbury. *BUILDER Journal*, 1868, xxvi, 863.

WELCH GROIN. See WELSH GROIN.

WELD. The combination of two pieces of iron or steel effected by hammering when the heat of the two surfaces is nearly equal to that of fusion. If tested by hydraulic pressure to over 120 tons per square inch a flaw could be discovered. For butt and lap welded; see PIPE. The term for joining brass is BRAZING; for soft metals, is SOLDERING. "Welding heat" is that degree of heat which smiths give their iron in the forge when they have occasion to double it up. Two pieces of iron at a white heat (2,372°, HEAT) may be hammered together and form one piece, without any mark of the adhesion being left. VARLEY, *Working Iron and Steel*, in SOCIETY OF ARTS, *Transactions*, 8vo., 1831, p. 251-88. Welding iron plates and bars or a lap joint; CIVIL ENGINEER, *etc.*, *Journal*, 1844, vii, 35. Forging or welding sheets or plates; *idem*, 1854, xviii, 321. Joining lead or other pipes by pressure only; INST. OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1859, xviii, 405. Welding iron wire; *BUILDER Journal*, 1861, xix, 220. Welding by hydraulic pressure, *idem*, 1864, xxii, 748. Electric welding, at BRITISH ASSOCIATION at Leeds, Sept. 1890; *idem*, 1890, lix, 206. New system by T. Fletcher of Warrington; BRITISH ARCHITECT *Journal*, 1888, xxix, p. 72 and 240.

WELDON STONE. These quarries are situated near Kettering, in Northamptonshire. They supplied material for many buildings as at Ely, where the ribs of the vaulting of the galilee with a filling in of clunch. At Cambridge—at King's College chapel, as 1480-83, stone from Weldon, Haselborough, and other places (i, 473); 1508-9, from Weldon, Clipsham, and Yorkshire (i, 476); 1513, Weldon for the finials and towers at the angles £100 (i, 480). Above the magnesian limestone, Weldon and Clipsham are employed throughout, except for the vaults of the north and south porches, which are a stone from Hampole in Yorkshire, yellower in colour than the former (i, 487). 1560-1, for Trinity college (ii, 566). 1564-73, Caius college; from King's Cliffe and Weldon (i, 174). 1638, at Jesus college; for all the work under bishop Alcock, as the great Tower gate, door-case into the cloister and the arcades, the "jawns and window-heads" of the hall, which have all been mended with Ketton stone; the chapel has no samples of Weldon (ii, 174). 1638, Clare hall; ashlar and blockstone from Ketton and Weldon, with clunch from Haslingfield, and slate from Collyweston (i, 94); WILLIS AND CLARK, *Arch. History—Cambridge*, 8vo., Cambridge, 1886. In many country mansions, as 1570 Kirby hall; 1577 Lyveden; 1577 Rothwell market-house; Geddington cross; many churches of same date at Cambridge. Lately at Rochester cathedral; at Kettering; Rothwell board-school; manor house at Brigstock; and under J. L. Pearson. R.A., at the university library at Cambridge, and at the chapter-house of Lincoln cathedral.

A new supply of good stone is now (1891) being worked. It has a rich creamy colour; its close texture and perfect crystallisation enable it to resist the action of frost and water. Weldon stone saws readily without water, and so harshens by exposure that work 300 years old is still sharp. Its crushing

weight, cracked, is 140.3 tons per square foot. Three qualities are furnished, "best selected, good fine, and coarser." *Building Stones of the Lincolnshire Oolite*, *BUILDER Journal*, 1891, ix, 21-3.

WELL. This term is usually restricted in its application to excavations by means of which water is obtained from strata beneath the surface. The excavations through which access is obtained to a deep-seated mine, or tunnel, or other underground operation is called a **SHAFT**. A deep PIT may be a sort of well. **VITRUVIUS**, viii, 7, describes the care necessary in forming a well. Attica was chiefly supplied with water by wells. Solon made a law that where there was a public well, all within the distance of four furlongs should use it, and beyond it they were to provide a well of their own; and if they dug ten fathoms in their own ground and could not find water, they had liberty to fill a vessel of six gallons twice a day at their neighbour's; **PLUTARCH**, *Lives*, transl. by **LANGHORNE**, edit. 1831, i, 195. **RAINWATER**. **PUTEUS**. There is often found in England a deep pit; this may have been a well, columbarium, or grave, such as was found at Stone, Richborough, etc., cave at Royston, Hertfordshire; or even a **NECESSARIUM**. **ABSORBING WELL**, or dead well; an excavation for carrying off foul waters, or excess of land springs. **CESSPOOL**. **ARTESIAN** fountain or well; a well sunk to obtain a supply of water rising to the surface. **VENETIAN WELL**; see **VENETIAN CISTERN**; a receiver and filter of rainwater used at Venice. **TUBE WELL**; a pipe forced into the soil, receiving water, which is pumped up to the surface.

A long list of wells cited as existing in old castles, churches, and houses has been omitted for want of space.

WELL DIGGER. For ordinary wells, of brick or stone, above 6 ft. depth and not exceeding 30 ft., includes labour only to steining dry, and finding gear, tackle, buckets, and stages; but curbs and pumps are extra. Tenders for fourteen wells, 20 ft. deep, 7 ft. diam., at Wandsworth, *BUILDER Journal*, 1856, xiv, 576. London clay if left exposed to the air for a few hours, expansion takes place and the surface falls away; the walls of wells were frequently fractured unless allowance were made for it. A well of 4 ft. diam. at Richmond completely closed in one night by the swelling up of the bottom, although there was not any water in it. In the construction of wells for water, it is advisable to use siliceous materials as much as possible, and to employ the argillaceous cements; also to keep them far away from the influence of dung-pits, cesspools, graveyards, and other receptacles of decomposing organic matter. Carbonic acid often accumulates in large quantities at the bottom of wells; its presence may be ascertained by letting down a lighted candle which will be put out as soon as the flame comes in contact with the gas. It may be absorbed by pouring down limewater gradually, trickling down the sides, and through the rose of a watering-pot down the middle; and then by throwing in some five or six pounds of quicklime in lumps; by the next day the gas will be absorbed and the well safe.

Papers on *Wells and Boring for water* in this and other countries; in **INST. OF CIVIL ENGINEERS**, Index i-xx, 8vo., 1865. **DEGOUSSÉ ET LAURENT**, *Guide du Sondeur*, 60 pl. atlas, 8vo., Paris, 1861. **SWINDELL**, *Elementary Treatise on Well Digging and Boring* (Weale), 8vo., 1849 and later editions, 1877. **LATHAM**, *Supply of Water*, in **CIVIL ENGINEER**, etc., *Journal*, 1865, xxviii, 40. **EMMERY**, *Puits Artésiens d'absorption*, etc., 8vo., n.d. **GARNIER**, *Nouvelle Arch. hydraulique*, 4to., 1790. **VIOLETT**, *Théorie des Puits Artésiens*, etc., 8vo., 1839. **CRABE**, *Poysos Artesianos*, 8vo., 1850. *Les Puits Artésiens*, by Darwin, S. Pol, Parenty, Dufaitelle, etc., many volumes. **BEARDMORE**, *Hydraulic Tables*, 12mo., 1852, p. xxxv. **AIDE MÉMOIRE**, 8vo., 1852, iii. **LUCAS**, *Rural Water Supply*, in *Transactions of INSTITUTE OF SURVEYORS*, xiii, 149, gives tables of cost and quantity of water obtained by boring in various localities. **LUCAS**, *Horizontal Wells*, a new application of geological principles to effect the solution of the problem of supplying London with pure water, 4to., 1874. *London Wells*; *BUILDER*

Journal, 1861, xix, 556c; *BUILDING NEWS Journal*, 1872, xxiii, 460; Dr. Letheby's report on same, August 1866. *Wells of Liverpool*, in **CIVIL ENGINEER**, etc., *Journal*, 1855, xviii, 401.

CAUTLEY, *On the Use of Wells, etc., in Foundations*, as practised by the natives of the Northern Doab; in **PAPERS OF CORPS OF ROYAL ENGINEERS**, 8vo., 1851, new series, i, 50. *Indian Well-sinking for Foundations*, in **CIVIL ENGINEER**, etc., *Journal*, 1860, xxiii, 60. **THE ILLUSTRATED BUILDERS' JOURNAL** for Sept. 19, 1865, gives from *The CALCUTTA ENGINEERS' Journal*, an account of undersunk foundations, or wells for piers for bridges; on the East Indian railway the well No. 1 on the Howrah side, at the Armenian ghat, was sunk 87 ft. below rail level, perhaps the deepest known.

BURNELL, *Recent Deep Wells and Borings*, *BUILDER Journal*, 1862, xx, 99; and **CIVIL ENGINEER**, etc., *Journal*, xxv, 77, 107. Warren Farm well, Brighton, 1,226 ft. 3 ins. deep; **B. J.**, 1862, xx, 139. Artesian well boring at Birmingham; *idem*, 1859, xvii, 843. In royal horticultural gardens, South Kensington, *idem*, 1862, xx, 93. **ENCYCLOPÆDIA BRITANNICA**, 9th edit. It was reported early in 1887 that a depth of over 5,200 feet had been reached by some Prussian mining engineers in boring at Schladerbach, near Halle. The sub-wealden exploration in Sussex reached a total depth of 1,905 ft., limited by the want of a lining to prevent the hole falling in on the rods and jamming them; **BRITISH ARCHITECT Journal**, June 22, 1877.

WELL; **WELL CHAPEL**; **HOLY WELL**. Many wells, in ancient times, had a certain sanctity and miraculous properties, and sometimes a marvellous origin, attributed to them. Some are found to be medicinal waters, and therefore had curative properties; and it was in accordance with "the spirit of the age" to put such wells under saintly invocations, and to attribute their virtues to the miraculous power of the self-chosen patron. Others had no inherent virtue beyond that which all pure cold water possesses. If the tenacity with which the people cling to local superstitions be considered, some of these springs and wells may have been the same to which a superstitious veneration had been paid in the days of heathenism, as may be judged from Canute's enactment against worshipping at fountains and trees. The crooked pins which the Irish peasantry still drop into the holy wells of that island, are among such practices. Some wells were used as baptisteries in connection with the churches adjoining them; and others by the side of a chapel or hermitage; **BLIGHT**, *Remarks on the Well-chapels of Cornwall*, in **JEWITT**, *Reliquary*, 8vo., 1861-2, ii, 126-36. **S. Winefrid's**, or **Wimfred's well**, North Wales (3rd November), having a basin of an eight-pointed star-shape with a large bath outside, was erected by Margaret, countess of Richmond, mother of Henry VII; **PENNANT**, *Tours in Wales*, 8vo., 1778; 1810; **ARCHÆOLOGICAL JOURNAL**, iii, 148. *BUILDER Journal*, 1890, lix, 168. This and the Ffynnon Wigfair, near S. Asaph, are both good examples of the Perpendicular period. *The Springs or Wells of Norfolk*, in **TAYLOR**, *Index Monasticus*, fol., 1821, p. xx. *BUILDER Journal*, 1862, xx, 635; **CHURCH BUILDER Journal**, April 1871, p. 62. **HARDY**, *The Holy Wells of Ireland*, places of pilgrimage and penance, 8vo., Dublin, 1836.

Well dressing, at Tissington, in **JEWITT**, *Reliquary*, 8vo., 1862, iii, 29.

WELL-COVER. One of wrought iron in cathedral square at Antwerp dated 1470; **HEFNER ALTENECK**, *Serrurerie*, fol., Paris, 1869-85, pl. 84. *Illustrations*, pl. 205 or 132, and ii, 59, s. v. Metal-work. **VIOLETT-LE-DUC**, in *Dict. raisonné*, s. v. *Puits*, vii, 561, gives many cuts of the cover and the curb or basin. A well is often covered by folding doors under a windlass, which are generally self-closing for safety, after opening by the rising bucket.

WELL-CURB or HEAD. (Fr. *margelle*; **DALY**, *Revue Générale*, 1859, xvii, pl. 37-9.) The framework round the opening of a well. The noble vase of white marble in the middle of the "hall of the vase" in the museum of the Capitol, at Rome, was

found under the tomb of Cæcilia Metella, and is evidently the mouth of an ancient well; the marks of cords are visible. Two Venetian well-curbs; *BUILDER Journal*, 1888, iv, 304; a bronze one and another, at Venice, *idem*, 1891, lxi, 250. ONGANIA, *Raccolta delle vere da pozzo (Marmi pluteali) in Venezia*, 2 pts., fol., Venice, 1889; reviewed in *ROY. INST. OF BRIT. ARCHITECTS, Journal*, 1891, p. 275.

WELL-CURB. The ring of elm or metal upon which the brick lining of a wall is built.

WELL-HOLE. The whole space left for the stairs; as in Moxon, *Mechanick Exercises* (Carpentry), 4to, 1694, p. 169. The square staircase at Amesbury, Wiltshire, is formed around a well-hole in which is placed another smaller stairs. Also the opening left in large winding or other staircases between the two chief flights, by which a third side is obtained for two or more steps, and on the fourth side for a landing.

WELL-HOLE. The term for the opening through a floor or floors, in a large warehouse, whereby light can be obtained from a glass roof over it, to each floor. It is excessively dangerous in respect of a fire spreading rapidly. These well-holes in a ground or first floor are often covered with a glazed platform; useful diagrams are given in *SPECIALITIES Journal* for January 1891, p. 82.

WELL-HOUSE. An example of xv cent. still exists at Haughmond abbey, Shropshire. A notable example is at Carisbrook castle, where to this day the water is raised by a donkey treading in a revolving cage.

WELL-STAIRS. A circular staircase with a hollow centre or well-hole between the ends of the steps. To draw one, "a well or spiral staircase" is explained in *BUILDER Journal*, 1851, ix, 55. GEOMETRICAL STAIRCASE.

WELLAND (JOSEPH), born 8 May 1798, at Middleton, in the county of Cork, Ireland. He became a pupil of John Bowden of Dublin. He designed Monaghan gaol and court-house; and many other works. About 1826 he was appointed one of the architects to the Board of First Fruits; 1833 one of the four architects to the Ecclesiastical Commissioners for Ireland at £800 per annum; and 1843 was sole architect until his death on March 6, 1860, aged nearly 62. Considerably more than a hundred churches have been erected from his designs, as at Magherafelt and Ballymene, co. Derry; Ballymoden, Bandon, and 1847 S. Nicholas at Cork, co. Cork; 1843 S. John's at Limerick; besides numerous alterations and restorations. He left a son WILLIAM, who with ... Gillespie succeeded the father as joint architects; and 1861-2 restored the interior of the cathedral at Londonderry. *DUBLIN BUILDER Journal*, 1860, ii, 232.

WELLESFORD, Wilsford, or Wilsford, anciently called Wivelsford, in Lincolnshire, situated five miles westerly from Sleaford, includes part of the village of Ancaster. In the south-west portion of the parish, in the heath enclosed in 1775, is the oolite freestone known as ANCASTER STONE; the quarries supplied stone for Windsor castle 37-39 Edward III, 1363-66. The present quarry supplies a sandstone of the oolite formation, for building in Grantham and neighbouring towns.

WELLINGTON. A town founded 1839, situated on both sides of port Nicholson, in New Zealand, of which it is the capital since 1865. It was laid out by S. C. Brees, C.E., principal surveyor and engineer of the New Zealand colony. There are few brick buildings; most fell down in the earthquake of 1848. The Government houses of assembly and buildings, of which the first stone was laid 9 March 1857, were designed by C. M. Iggesden, revised (?) by G. Single, R.E. (*BUILDER Journal*, 1857, xv, 353; xvii, 344). The New Zealand post and telegraph office, 1880, is by Mason and Wales (*idem*, xxxix, 483). PENNY CYCLOPÆDIA, Supp., 1858, p. 782. Brees, *Pictorial Illustrations*, fol., 1847. Two views in *ILLUSTRATED LONDON NEWS*, 1847, xi, 168. Railways, *B. J.*, 1870, xxviii, 302. *ROY. INST. OF BRITISH ARCHITECTS, Journal*, 1887-8, p. 329. KIRK, BALFOUR, AND WARD, *New Zealand Timber*, 8vo., Well., 1875; and by

BLAIR, 8vo., 1879. J. C. CRAWFORD, *Travels in N. Z. and Australia*, 8vo., 1880.

WELLINGTONIA GIGANTEA; called Baobab Americana and Sequoia gigantea. A coniferous tree of Victoria, in Vancouver's island. It is allied to the SEQUOIA sempervirens. The timber is of a reddish hue, light and soft, easily worked with ordinary tools, has a fine grain; is perfectly good to the heart and very durable; it can be used in lieu of mahogany for interior fittings. Its general height is 250 ft. with a diameter 28½ ft. at the base and up to about 100 ft. high, when it tapers gradually, being 5 ft. 6 ins. at 200 ft. Its weight when quite dry is 34 lbs. to the foot cube. One tree of Calaveras county was 32 ft. diam., 302 ft. high, with more than 2,500 rings; it was cut at 20 ft. from the base; *BUILDING NEWS Journal*, 1871, xx, 393. *BUILDER Journal*, xvii, 78; xxi, 763. B. TAYLOR, *Home and Abroad*, 2nd ser., New York, 1880.

WELLS. A city, the county town of Somerset, England, near the source of the river Ax, consisting chiefly of four main streets. It has been the see of a bishop from early in x century, and has the unusually complete series of mediæval buildings belonging to its ancient cathedral establishment (PARKER). The cathedral is dedicated to S. Andrew the apostle. Canon CHURCH, in *Reginald, Bishop of Bath* (1171-91), and his share in the *Building of the Church at Wells* (ARCHÆOLOGIA, i, 1887, pt. 2), considers that Reginald deserves a place of high honour in the history of the fabric; the work of bishop Robert (the author) dates 1148-66; of Reginald Fitzjocelin de Bohun 1174-91, documents show that building operations were in hand, but no fabric rolls exist; then occurs an interval of some twenty-eight years; and Jocelin (the finisher) 1219-39; the first and last obscuring the work of Reginald. The general design of the portions eastward of the west front belong to Reginald, but were stopped in the nave; all Robert's work is said to have perished; the three western arches of the choir were recast by Reginald, and the great break between Reginald's and Jocelin's work may be westward of the north porch, in the arches of the nave which run on to the west front; here the masonry improves (WILLIS); here it was stopped in 1196 and suspended until 1219, presenting a gaping chasm between the unfinished nave and the old Norman front; which old front Jocelin Trotman, in perhaps 1219, pulled down and rebuilt in the rich Early English style of the period; and joined it to Reginald's unfinished nave by the three arcades in the earlier style but adapted, of his predecessor. Jocelin died in 1242.

In vol. li, pt. i, 1888, the canon also gives *Some account of Savarie, Bishop of Bath and Glastonbury*, 1192-1205, showing there is no mention in the registers of any gifts made by him to the fabric, or of work done by him. In vol. li, pt. 2, CHURCH also gives *Some account of Jocelin, Bishop of Bath*, 1206-42, being Jocelin Truttmann or Trotman, son of Edward de Welles, who in 1207 might have begun the palace; and after 1220 "he repaired, enlarged, completed and reconstructed the church anew" 23 Oct. 1239; (north porch 1174-91; in *B. J.*, 1848, vi, 174). Some names of workmen are given, but nothing is known of those who planned or executed the noble gallery (upwards of 300 figures from 2 ft. to 8 ft. high) of early Christian (English) art displayed in the west front, 147 ft. 6 ins. long. Mr. J. T. Irvine points out that a small figure over the great south-west doorway is coeval with the erection of the front; it is sitting in a secular costume and without tonsure, and may be intended to commemorate—the unknown architect (or sculptor): and in *BUILDING NEWS Journal*, 1871, xx, 306, notices the use of Arabic numerals on some figures over the end of north aisle of nave. Of the two west towers, the upper part of the south one dates 1366-86, and the north one 1408-24. The great central tower 1318-21, with inverted arches 1340, is 160 ft. high. Before 1326 the choir was completed (priest's door in *BUILDER Journal*, 1846, iv, 307), with the stalls, including the fine lady chapel, a pentagonal apse (large view of interior in the *ILLUSTRATED LONDON NEWS*, 1856, xxix, 242). The build-

ing is 385 ft. internally from east to west, and 135 ft. across the transepts; the nave 38 ft. wide, 82 ft. with aisles, and 67 ft. high. The singular octagonal undercroft 1286, on the same level as the floor of the church is earlier than the chapter-house over it (1293-1302 or 1325) which is raised 20 ft. above the floor; it is 52 ft. 6 ins. diameter, and 42 ft. high, with a central pillar and fifty-one stalls. The system of proportion shown in the building and chapter-house is discussed by CRESY, in GWILT, *Encyc. of Architecture*, 8vo., edit. 1888, p. 1024-7. Sugar's chantry, B. J., 1846, iv, 102, 114; stall ends, *idem*, 391, and litany desk, 403. Chantry of bishop Beckington, died 1464. Tomb of W. de Marchia, died 1302; B. J., 1886, i, 848. Of the south cloisters, the east side (lavatory and library over) date 1408-24, and is 163 ft. long; the west side 166 ft., part of the south side with the chapter grammar-school over, date 1443-64; the remainder was built soon afterwards. The bishop's throne xv cent. Processional stones in the nave.

Restorations were contemplated 1842 by C. R. Cockerell, R.A.; the lady chapel and rood screen were restored 1844 by Benj. Ferrey, who with sir G. G. Scott began the west front but resigned in 1848; and up to 1854 A. Salvin re-stalled the choir with stone canopies, and restored the vaulting. From 1868 the west front by B. Ferrey was under restoration. DALLAWAY, *Discourses*, 8vo., 1833, p. 168, states that the façade of Bruxelles cathedral nearly resembles that of Wells, but is inferior in point of ornament (of xiv cent.). The stone used was from Doulting, where the quarry still bears the name of S. Andrew (BUILDER *Journal*, 1851, ix, 747).

WILLIAM OF WYRCESTER, *Ibin.*, cir. 1450. DAVIS, *Concise History of the Cathedral*, 12mo., 1809; 1814; 1825. CARTER made drawings for the Society of Antiquaries, fol., 1794; and his *Ancient Architecture*, etc., plates dated 1784-86, fol., 1795-1807. BRITTON, *Cathedral*, 4to., 1824; and reprint, 12mo., 1847. COLLING, *Gothic Ornaments*, 4to., (1848-50). WINKLES, *English Cathedrals*, 8vo., 1836. COCKERELL, *Iconography of the West Front*, 4to., 1851; disputed in BUILDER *Journal*, 1856, xiv, 478. PETTIGREW, *The Cathedral*, in *Journal of the ARCHEOLOGICAL ASSOCIATION*, 8vo., 1856, xii, 344. PLANCHÉ, *On the Statuary*, *idem*, xiii, 1-33. E. W. GODWIN, *The Cathedral*, in B. J., 1862, xx, 618. WELLS, *The Cathedral*, *idem*, 1863, xxi, 671-2. LIGHTLY, *On Photographs of the Sculptures* by Candall, at ROY. INST. OF BRIT. ARCHITECTS, 1863; and FERREY, *Observations on West Front*, *idem*, 1870, 21 November. FREEMAN, *History of the Cathedral*, as illustrating the history of Cathedral Churches of the old foundation, 8vo., 1870. H. E. REYNOLDS, *Wells Cathedral, its foundation*, etc., fol., Exeter (?), 1881. KING, *Western Cathedrals*, Wells, 8vo. (Murray), 1861.

The episcopal palace is to the south; its embattled wall 1329-1400 by R. de Salopia and R. de Erghum, encloses an area of seven acres 1329-65, and has a broad moat still filled with water; the beautiful gate-house and bridge 1443-65 is one of three by bishop Beckington; BUCKLE, *Wells Palace*, in SOMERSETS. ARCH., etc., 1888, xxxiv. The xiii cent. work of two floors by Jocelin 1206-42 was 1846 restored by B. Ferrey; and the crypt 1890 adapted for a dining-hall for the bishop. The guesten hall 1275-92 is internally 115 ft. by 60 ft. and in ruins, the solar is 60 ft. by 23 ft.; the chapel adjoining 52 ft. by 26 ft. was restored 1608, and by B. Ferrey. The hall adjoining at the north-west angle, by Beckington 1443-66, is 52 ft. by 24 ft. and 17 ft. high with a flat ceiling, with kitchens, etc.; the staircase formed 1560-81 is in the Elizabethan style. PARKER, in B. J., 1861, xix, 644; and also 1871, xxix, 26. The deanery 1475 is a good specimen of a residence, has a good chimney-piece in the hall, a bay window, gate-house, and wall of enclosure. The archdeaconry, temp. Edward I, nearly as important, was restored 1889 by E. Buckle; it is early xv cent. work with a fine roof to the hall, now used by the Theological college. The house of the choir-master, small, xv cent. Opposite to it is the house 1450 of the master of the fabric. The organist's house xiv cent. next the school is in ruins. The canons' houses in the Liberty

ARCH. PUB. SOC.

are xiv and xv cent. and a hall. The vicars' close or college 1443-64, of twenty-one houses, on each side of a court with a chapel at one end, and a hall; WALKER, *The Vicars' Close*, 26 pl., 4to., 1836; B. J., 1847, v, 338. A house adjoining it and a hall of xv cent. were pulled down 1861. The bishops' barn 110 ft. by 25 ft. 6 ins. is early xv cent.

S. Cuthbert parish church, is chiefly of the third pointed period; part of the north transept is xiii cent.: the church was rebuilt in xv cent., when the pillars were heightened, arch stones reused, aisles, clearstory, and roof added, in late Perpendicular; fine lofty west tower about 1430; BUILDER *Journal*, 1863, xxi, 642, 715. The contract 1470 for the Jesse altar in south transept, "between the wardens of our ladye altar with John Stowell of Wells, freemason, for £40", is given in B. J., 1857, xv, 326. 1857, S. Thomas's church, by S. S. Teulon, B. J., xv, 759; xvi, 840. A collegiate grammar school 1242 and later dates. The town hall of 1780 has been rebuilt. The market dates 1836. The row of houses on the north side of the market-place and the two lofty gateways on the west side were built by bishop Beckington 1443-65. Bishop Bubwith's almshouses 1436, somewhat injured cir. 1850, the chapel adjoining is early xv cent., and restored lately; and at the west end is a fine hall built after 1424, the former city guildhall. (Bishop Still's or) W. Bricke's almshouses 1614 or 1637; B. J., 1849, vii, 510, 533; and bishop Willes's almshouses, died 1773. The Crown inn is a framed timber house. The market cross 1541 by bishop W. Knight, and conduit disappeared about the end of xvii cent. COLLINSON, *History of Somerset*, 3 vols., Bath, 1791, iii. PARKER, *The Antiquities of the City*, in B. J., 1862, xx, 654-5; and *The Arch. Antiquities*, 8vo., Oxford, 1866. SOMERSETSHIRE ARCHEOLOGICAL SOCIETY, *Proceedings*, 8vo., Taunton, 1849 et seq. CHURCH, *Documentary Evidence relating to the Early Architecture of the Cathedral*, 1888, pt. ii, etc. PHELPS, *Somersetshire*, 4to., 1836-39, i, 496. JACKSON, *Tourists' Guide*, 1888. B. J., 1891, p. 352, gives plan and view. Most of the illustrations noticed as in the *Journals* were made by F. T. Dollman. 14. 19. 28. 96.

WELLS (J... C.), of the United States of America. He designed several of the public buildings of New York, including Dr. Phillips's church on the fifth avenue; various large stores, a court house at Wilkesbarre, Penn. He died before Oct. 6, 1860, just before the vessel reached England, of which country he was a native. BUILDER *Journal*, 1860, xviii, 647.

WELSH ARCHITECTURE. The antiquities of all sorts, and Churches are noticed in the prefaces to the *Handbooks* to north and south Wales (Murray). A strong family likeness runs through the churches of different portions of the country (South Wales), as in Monmouthshire, where the Somersetshire type most prevails; or in Gower and Pembrokeshire, which are remarkable for their rude military buildings; FREEMAN remarks that twelve out of the sixteen churches of Gower have towers evidently built for defence. *The Building Stones of North Wales and the borders*; BRITISH ARCHITECT *Journal* Sept. 1879, p. 89, 109. PENNANT, *Tours in Wales*, 4to., 1778; 1784; 1810. MALKIN, *South Wales*, 8vo., 1807. NORRIS, *Arch. Antiq. of Wales* (S. David's), fol., 1810-12. BINGLEY, *North Wales*, 8vo., 1814. PUGH, *Cambria depicta*, *North Wales*, 4to., 1816. *Excursions in North Wales*, 12mo., 1848. EVANS, *Walks through Wales*; *Seats*, etc., 12mo., n.d. CHIEFF, *Book of North Wales*, 12mo., 1851. *Sketches chiefly ecclesiastical, to close of xii cent.*, 3 series, 12mo., 1853. JONES and FREEMAN, *Antiq. of S. David's*, 4to., 1856; and *Llandaff Cathedral*, 8vo., 1850. NORRIS, *Etchings of Tenby—early Flemish Architecture*, 4to., 1812, and *Historical Sketch*, 12mo., Tenby, 1856, 2nd edit. LLOYD WILLIAMS and UNDERWOOD, *Village Churches of Denbighshire*, fol., 1873; and *Denbigh Castle*, *Wrexham*, etc., fol., 1873. *Welsh Castles and Palaces*, at *British Archaeological Association* at Tenby, 1884, in BUILDER *Journal*, xlvii, 350, 354. *Welsh Wales*, *idem*, 1865, xxiii, 672. CLARK, *Medieval Military Architecture of England*, 8vo., 2 vols., 1884. 28.

WELSH CARPET. A pattern produced on a brick floor by

staining the brick squares in figures with dock-leaf juice. The prettiest pattern is perhaps produced by rubbing half of each square diagonally with dock-leaves. The diced appearance is very pretty; the uneven floor wears out very soon; HOUSEHOLD WORDS *Journal*, Sept. 1854, p. 53.

WELSH GRANITE. It is used largely for paving in Liverpool and Manchester; a small quantity is sent from Wales to London where it is thought to wear slippery. Penmaenmawr or blue Welsh was tried at Bradford with other granites; *BRITISH ARCHITECT Journal*, May 24th, 1889, p. 385. Quarries at the Eifl and Gwylwyr mountains, Caernarvonshire, furnish good pitching setts. GRANITE. PAVING SET. SETS. R. R. R.

WELSH GROIN, often written Welch groin. Arched work in a vault crossing another vault transversely, but being of a less pitch or height. It is also called UNDERPITCH GROIN. The origin of the term is unknown. The roofing of the aisles and of the centre compartment of the body of S. George's chapel, Windsor, is in fact a waggon-headed vault broken by Welsh groins; that is to say, groins which cut into the main arch below the apex; POYNTER AND ASHTON, *Windsor Castle*, fol. 1841. NICHOLSON, *Carpenters' New Guide*, 4to., 1801, 3rd edit., 28. At S. Peter's Mancroft church, Norwich, the timber roof has Welsh vaults over the clerestory windows and the cornice brought out in front of them, not resting on the top of the wall as usual; RICKMAN, *Attempt*, 8vo., Oxford, 1848, 5th edit., liii, and 225. SCOTT, *Lectures*, 8vo., 1879, ii, 173, who shows an example from S. Martin-in-the-fields church, London, where the unpleasing true line of intersection is altered by their taking the lines given by vertical planes, and throwing the irregular geometric curve into the surfaces of the cells; or perhaps generating them by the motion forward of the side arch. At p. 214 he describes the beautiful work in the choir at Gloucester; and in the nave at Winchester.

WELSH LUMP. A fire-lump, so called because it is much larger than a fire-brick. It can be had up to 3 ft. long, 10 ins. by 5 ins. thick. A fire-brick is 9 ins. by 4½ ins. by 2½ thick, and weighs about 7½ lbs. It is not only made in Wales but also at Newcastle, Poole, Stourbridge, and near Glasgow. 1.

WELSH RAG. Also called RAG SLATE. 1.

WELSH SLATE. See SLATE.

WELTED JOINT. The old system of making a junction of the sides of two lengths of lead on a church roof, is preferred to the present system of a deal roll.

WEMHE. See WAINE.

WENDLIND (MARC) de Mutzig or Mutzich, towards the end of xv cent. was master of the works at Strassburg. His seal exists. SCHNÉGANS, *Maitres d'œuvres*. LANCE, *Dict. Biog.* WENSZL (HEINRICH DUERNSTETTER), 1399 was *werkmeister* at the dom of Regensburg. 92.

WENZL, of Prag. A celebrated *steinmetz* who flourished 1475. 26.

WENZLA (meister), of Klosterneuburg, 1359 *baumeister* at Vienna, who for Rudolph IV, completed his father's building at S. Stephen's church, by its vaulting and roofing; commenced a new choir, of which the first stone was laid 7 April 1359, and commenced the foundations of the two towers of the transepts. He died in 1404, when the south tower was about two-thirds completed. He was succeeded by Brachowitz and H. Buchsbaum, who designed the north tower and died 1454. 26. 92.

WEOLEY STONE, and Weoley castle stone. The quarries are situated west of Birmingham, where it was used 1840 in S. Matthew's church, and in S. Mark's church; also in the arches and as bands in the inside of Selby Oak church, near the town. Perhaps the same as that supplied from the Wilmetcote quarry, used at Birmingham.

WERCIN (GUILLAUME DE), l'aumônier, fifteenth prelate of the abbey of Vicogne () who 1260 rebuilt his church and dedicated it to the Virgin, who gave him the form and model for it. LEROY, *Archiv. hist.*, in LANCE, *Dict. Biog.*

WERF (ADRIAAN VAN DER), born at the end of xvii cent., of

Rotterdam, where he designed the exchange built in 1726-35, and was appointed town architect. 24.

WERHERUS, Wernherus, and Werworiis. 1142 a *steinmetz* of Prag, where he built the jungfernstift bei S. Georg, after it had been burnt. 26. 68.

WERKA and Wurka. See WARKA, in Mesopotamia.

WERLINGHOVEN (FLORIS VAN). See UTRECHT.

WERLY (FRANÇOIS). See VERLY (F.).

WERRY (JEAN ALEXANDRE), born 12 May 1773, at Bruxelles, executed the new prison and many houses there. He was professor of the académie de dessin. GOETGHEBUER, *Monumens, des Pays Bas*, fol., Ghent, 1827.

WERST. A measure. See VERST.

WEST. The "west end" of towns is a special growth; it is attributed by the academy of Sciences at Paris to atmospheric pressure; *BUILDER Journal*, 1855, xiii, 192. ORIENTATION.

WEST END. While nearly all the English cathedrals and large churches have been increased in length eastward, the west end stands on the foundations laid down by the first builders; the large eastern works having been made in consequence of the increase of shrines and accommodation of votaries; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1886, p. 38. The west front of a church of whatever class is usually more elaborately decorated than any other part of its exterior. A tower in the middle of it, or a tower at each end of the façade, is usual though not essential.

WEST APSES in choirs and crypts, from ix to xiii centuries, in Germany, are to be seen at S. Gall (plan); Fulda old church; former dom at Cologne; the dom and S. Stephen at Mainz; the doms at Worms; Speier; Augsburg; Bamberg; and Naumburg; the Katharinenkirche at Oppenheim; Stiftskirche at Essen; heil. Kreuzkirche in Lüttich; Sebaldskirche at Nuernberg; and churches in Gernrode and Dribeck. 92.

WESTERLY (ROBERT), 1440 as master mason at the erection of the college at Eton, Buckinghamshire, had a warrant to take masons for the king's service; TIGHE AND DAVIS, *Annals of Windsor*, 8vo., 1858, i, 334. BENTLEY, *Excerpta Historica*, 4to., 1831, p. 45-6. LYNDE. SMYTHE. WHETELAY (R.).

WESTMACOTT'S PLASTER. This was patented 12 Aug. 1862 by C. M. Westmacott, as "prepared patent carbonate". See LIME PLASTER. KERR, *On Artificial Stone*, 1862-63, p. 148, 152; and *Report of the committee of the Roy. Inst. of British Architects*, May 23rd, 1864, p. 159 and 167.

WESTMINSTER ABBEY. The church and monastery, dedicated to S. Peter, are said to have been founded between 604 and 616 by Sebert, king of the East Saxons, on Thorney island, so formed by the river Thames and branches of it. In 1050, the foundation was laid of a new building by king Edward the confessor; it was erected in the form of a cross—then a novelty in England; and dedicated December 28, 1065. The bases of pillars and walls on each side of the sanctuary only remain; *The Deanery Guide*, 4to. (1889), p. 7.

xiii cent. Eastern portion, including the chapels round the apse; both transepts; the crossing; and the chapter-house, by king Henry III. Four (five) bays westward of crossing to one bay beyond choir screen, by king Edward I. 1220, chapel of the Virgin begun; and 1245, the body of the church began to be rebuilt; WALSHINGHAM, *Decem Scriptores*; SCOTT, p. 20. 1250, the chapter-house commenced, and nearly completed 1256; 58 ft. diameter, one of the largest in England; stands on a small crypt, formerly the royal treasury; roof removed 1740 as ruinous; it was thoroughly restored for the government 1865 by sir G. G. Scott, R.A., with new windows and glass. 1253 magister Albericus is paid for "form pieces", etc. (*BUILDER Journal*, xviii, 654). 1257-77 magister R. de Beverley, mason, mag. J. de Gloucester, and mag. Edward (Fitz-odo), goldsmith, of Westminster, masters and keepers of the king's works; (TURNER, *Dom. Arch.*, 8vo., 1851, i, p. 262). 1267-69-90, the shrine of king Edward the confessor made for the king; on it is inscribed "Petrus civis Romanus", etc.; SCOTT, 130, 132, 136. Abbot

Ware brought the Opus Alexandrinum pavement by Odoricus from Rome. 1285, "the new work"; ACKERMANN, p. 142.

XIV and XV cent., the nave continued westward; abbot's house, under Edward III; the north or Solomon's porch, under Richard II and Henry V. 1342, Walter le Bole, master mason at the abbey. 1350, nave and great cloisters begun, and finished 1364-66; SCOTT, p. 258. 1363-78, the abbot's house, etc., now the deanery, at south-west corner of the church, with south and west walks of the cloisters, erected. 1388-95, magister Henry de Yeveley, chief mason; R. Kentbury and T. Padington, masons. 1399-1416, mag. William de Colchester, master mason. 1413, works of the nave extension carried on; Alexander de Berneval of Rouen said to have designed it; SCOTT, p. 212; and RYMER, *Fœdera*, ix, 78. 1422-98, memorial chapel or chantry raised in accordance with the will of king Henry V; not completed even in 1460, Thurske master mason (STANLEY, *Memorials*, 3rd edit., 1869, p. 161, 602); Roger Jolinson made the gates. 1474, the great west window put up. 1484, William Turnour, master mason.

XVI cent., the two eastern bays of the vaulting of nave, and west front as far as towers, were completed. 1503, January 24, foundation laid for a chapel to king Henry VI, afterwards altered to that for king Henry VII; designer is still unknown; 1516, the painted glass; 1520, the chapel completed. (In 1809-22 this chapel was restored externally by T. Gayfere, mason, under James Wyatt, R.A.) The tomb 1512-18 by Pietro Torregiano; the grille probably by Humphrey Walker under master Pageny, 1506. 1557, the shrine of Edward the confessor again set up, and the wood enclosure on the top of it added; SCOTT, p. 140.

1604-9, tomb of queen Elizabeth by Max. Poutraine or Powtran, alias Colte or Coult, the king's master mason, and others; DEVON, *Issues*, p. 22, 27, 36, 50. Also the tomb for the princesses Mary and Sophia, *idem*, p. 60, 88, 289. 1606-13, tomb of Mary, queen of Scotland, by Cornelius Cure, the king's master mason, and his son William; *idem*. BUILDER *Journal*, 1863, xxi, 238. In 1620 and later, the south-east and south-west portions of the church repaired; ACKERMANN, p. 145, 260.

1713, restoration begun of west façade, under sir C. Wren, surveyor; lower part completed by 1722; when the circular window of south transept, the end of north transept and its rose window were rebuilt; NEALE, i, p. 196. 1723, S. Blaize chapel in south transept was removed by J. Gibbs for his monument to M. Prior. 1735-39, the two western towers raised by N. Hawksmoor, now 225 ft. 4 ins. to top of pinnacles. 1766, the choir fitted up. 1793, roof repaired; and part restored over east window; NEALE, p. 19.

1803, roof and central lantern restored after a fire; SCOTT, p. 77. 1814, marigold window of south transept restored. 1824, altar screen restored by M. Bernasconi (SCOTT, p. 68), and the choir stalls put up by E. Blore, F.S.A., who also 1849 restored the exterior of the north side of the nave. 1867, restoration of the altar screen or reredos; Solomon's porch; gable of south transept; interior, etc., of the chapter-house, all under sir G. G. Scott, R.A., up to 1878. From 1879 to 1891, restoration of the outside of the north transept above the doorways (BRADLEY, *A Stone Book*, in NINETEENTH CENTURY for April, 1891), the east end of the choir and the south side of the nave and aisle, under J. L. Pearson, R.A.

The length of the church within the walls is 370 ft.; the nave and aisles 72 ft. wide; the nave 103 ft. high; transepts are 195 ft. from north to south and 84 ft. 8 ins. wide; south transept 105 ft. 5 ins. high. The east end or apse had originally seven chapels, the centre one or lady chapel was removed to build the new chapel of Henry VII, and for it also a small chapel of S. Erasmus and the White Rose tavern were demolished. Its nave inside is 33 ft. 6 ins. wide, and 105 ft. long including the entrance; each aisle is 11 ft. 3 ins. wide; total width 66 ft.; and its nave 63 ft. high. NEALE, ii, 304.

The other parts consist of the chapel of S. Faith or old

revestry between south transept and the chapter-house. The Little Cloisters, the monks' infirmary, S. Catherine's chapel XII cent., greater part of which was destroyed 1571, and garden. Library in south transept over west end of the revestry and the outer vestibule of the chapter-house, to the old dormitory along the east side of the cloisters. Of the old refectory or frater, little more than the windows in the south walk of the cloister remain above its roof. The misericorde, and the lower dining-room were to the south, and are partly imbedded in Ashburnham house, erected about 1640 by John Webb. The chapel of the Pyx and treasuries, beneath the old dormitory, occupying two bays of the Confessor's work. The Jewel house, a square tower, was probably built temp. Richard II, for the royal jewels. At the deanery, the Jericho parlour was added by abbot Islip (*cir.* 1502-32); the Jerusalem chamber and college hall by abbot Litlington (1363-78) being his withdrawing room and refectory; the hall was warmed only by a brazier in the centre until dean Buckland (died 1856) introduced the stove.

CAMDEN, *Reges, Reginae, Nobiles, etc.*, 4to., 1600; 1603; 1606. ARITHMÆUS, *Musæolea regum, etc.*, 12mo., Franc., 1618. SANDFORD, *Gen. History of the Kings of England*, fol., 1677. KEEFE, *Monumenta Westmon.*, 8vo., 1682. CRILL, *Antiq. of S. Peter's*, 8vo., 1711; 1715; 1722; 1741; 1742. DART, *Hist. and Antiq. of Abbey Church*, fol., 1723; 1742. WIDMORE, *Hist. of the Church of S. Peter*, 4to., 1750-1. GOUGH, *Hist. Descr. of West. Abbey*, 1753. AYLOFFE, *Account of some Ancient Monuments*, fol., 1780. *Vetusta Monumenta* of the SOCIETY OF ANTIQUARIES, fol., 1747, ii, gives the royal tombs, etc. ACKERMANN, *History of the Abbey*, 4to., 1812. NEALE AND BRAYLEY, *History*, 4to., 1818. HARDING AND MOULE, *Antiquities in West. Abbey*, fol., 1825. COTTINGHAM, *Plans, etc., of the Chapel of Henry VII*, fol., 1822-29. G. L. SMYTH, *Monuments, etc., of the Abbey*, 8vo., 1826; *Biography*, 1843. CUNNINGHAM, *Handbook to the Abbey*, 16mo., 1842. RIDGWAY, *The Gem of Thorney Island*, 8vo., 1860; and *Westminster Abbey, its history, pageants, and royal memorials from 1065 to 1422*, 8vo., 1865. CHESTER, *The Abbey Registers*; in HARLEIAN SOCIETY, 4to., 1876. DALTON, *Companion*, 12mo. (1835), (1838). BEDFORD, *Chart illustrating the Arch. of the Abbey* (1840?). SUMMERLY, *Handbook to the Abbey*, 12mo., 1842. WALCOTT, *The Inventories of Westm. Abbey*, in LONDON AND MIDDLESEX ARCHAEOLOGICAL SOCIETY, *Transactions*, iv, 8vo., 1872. CAVELER, *Gothic Architecture*, 4 parts, 4to., 1835-6. WALCOTT, *Westminster; memorials of the City*, 8vo., 1849. BRITTON, *Architectural Antiquities*, 4to., 1809, ii, Henry VII's chapel. STANLEY, *Memorials*, 8vo., 1868; 1868, 1869 quoted, 1876, 1882. SCOTT and others, *Gleanings from Westm. Abbey*, 8vo., 1861; 1863 herein quoted. Report of Commission on want of space in the abbey; reviewed in BUILDER *Journal*, 1890, lix, 439.

DONALDSON, *Present condition of the Royal Tombs*, read at ROY. INST. OF BRITISH ARCHITECTS, *Sessional Papers*, 1851-2. PAPWORTH, *Some Westminster Tombs* (p. 6); and *The Master Masons and Architects* (p. 100 and 296), in *idem*, *Journal*, 1888-89; and POOLE, the abbey master mason from 1856, *Annals of the Masonry*, *idem*, 1889-90, p. 113, 136, 169, 187, 218, 253, 281, 301. *The Deanery Guide*, 4to., 1889, last edition. THE GENTLEMAN'S MAGAZINE, *passim*. *Inventory of the Vestry in the Abbey*, 1388, given in ARCHAEOLOGIA, 1890, lii, 195-286.

WESTMINSTER (EDWARD OF), also called Edward Fitzodo, son of Odo, goldsmith, of Westminster. See ODO.

WESTMORELAND (seventh earl of). See FANE (JOHN).

WESTMORELAND SLATE. A pale blue-green slate obtained at Coniston, Elterwalter, and Kendal, Westmoreland. SLATE.

WESTON (WALTER DE), 1331-48, 4-21 Edward III, was clerk of the works at the king's palace of Westminster and at the Tower of London (*Cal. Rot. Pat.*, fol., 1802, p. 109, pat. 2), succeeding W. de Kelleseye. In 1330 T. de Canterbury, master mason, began the chapel of S. Stephen: Weston's account roll

of expenses is in the Record Office. In 1338, 12 Ed. III, he was appointed to superintend the works in the castles and towns of Scotland, Kellesey being controller (*Rotuli Scotie*, fol., London, 1814, p. 513, 517, 526, 537). 1349-50, 23 Ed. III, Weston was made chaplain to the king, who gave him the sixth prebend of the chapel; and though he 1347-8, 21 Ed. III, may have been succeeded by P. de Bruges, yet he was still at the Tower 1349-52, 23-5 Ed. III; or Bruges may have been deputy to Weston; BRITTON AND BRAYLEY, *Palace of Westminster*, 8vo., 1836, p. 148-9, 161-2, 244, giving extracts from the accounts; in some passages he writes "William".

WESTON (WALTER DE), 1448, 26th Henry VI, contract for building at S. Stephen's chapel, Westminster; *Rot. Pat.*, p. 2, m. 35; as stated in DALLAWAY, *Discourses*, 8vo., 1833, p. 413, but not identified.

WESTPHALEN (meister ARNOLD VON), 1470-83 built the schloss at Meissen; also a bridge there long since destroyed, but mentioned as a great work by contemporary writers. In a letter dated 1471 with reference to the vaulting of the choir proposed to be done at Mitweida he is named *werkmeister* to the elector Ernest of Saxony. 68. 92.

WESTWOOD GROUND STONE. A stone obtained at the Bath freestone works, at Box, in Wiltshire; and also at Westwood. The former was said not to be used for weatherings, plinths, or copings, but only for interior work. The latter is stated to be a weather or ground stone, sound, of uniform texture, somewhat open in grain; in blocks 5 to 6 ft. in bed, large and shapely, and averaging from 40 to 50 ft. cube.

WET ROT. See DRY ROT. This occurs in the growing tree and where timber may become saturated with wet. If it can be protected, or thoroughly dried by seasoning, this disease can be prevented from being communicated.

WETTERSTEDT'S METAL. A "marine metal" for roofing purposes patented before 1834 by baron Charles Wetterstedt, and 1837 introduced into England. November 3, 1846, he obtained another patent for sheet metal, etc., being a combination of the regulus of antimony with lead. It is made in sheets 9 ft. long by 3 ft. wide, weighing 3 lbs. per square foot for flats; 2 lbs. for curbs; 1½ lb. for verandahs; 3 lbs. for covering steps, and 8 oz. for lining damp walls. It does not rust or decay under the action of the atmosphere or of acids; and resists that of the sun. Its lightness affords economy of construction; its malleability renders it capable of being easily worked. The large circular roof of the Polytechnic institution, Regent street, was covered with it in 1837, and used further in the extension of 1847; *BUILDER Journal*, 1848, vi, 173. The "patent metallic canvas" is a combination of this metal and canvas of various substances and strength; the metal of 8 oz. to the foot super. is used for waterproof tents, huts, sheds, temporary buildings, etc.; also for keeping back the damp in walls; sheets are made 8 ft. long by 2 ft. 8 ins. wide; *CIVIL ENGINEER, ETC., Journal*, 1847, x, 225. 1.

WETTING BRICKWORK. In hot weather it is best to soak bricks in water before use in the work, so that the dry bricks shall not imbibe too much of the water from the mortar and so prevent its due setting. In repointing old brickwork, the face is always well wetted before the application of the lime putty, or cement. 1.

WETZLAR. A town of Rhenish Prussia, situated on the river Lahn over which is a stone bridge. It is walled, having six gates, and was one of the free imperial towns. The houses are built in the old fashion German style. The dom or stiftskirche, dedicated to the Virgin, retains its XI century west front behind that of the xv still incomplete. The north transept is fully developed German Geometrical Decorated work resembling that of the south-west tower of Cologne cathedral. It has two distinct churches, the west end being arranged for the protestants from the close of XVI cent., if not divided earlier. There are several curious tombs. The interior of the north transept is given in *BUILDER Journal*, 1873, xxxi,

46; west front, 1874, xxxii, 969; north-east view, 1881, xl, 536; and the portal, 1881, xli, 542, with detailed descriptions: LANGE, *Materische Ansichten*, fol., Frank., 1836. An arcade in KUGLER, *Geschichte*, 8vo., Stutt., 1859, ii, 459. There are also another roman catholic church, three protestant churches, and a synagogue. 14. 50. 96.

WEY. Also wage and way in manuscripts. A weight of lead: also of wool; see WEIGHT. Wey is a weight of 5 quarters or 40 bushels, dry measure; of cheese in Essex, 32 cloves or 256 lbs.; in Suffolk, 42 cloves or 336 lbs.

WEYER (JEAN ANDRÉ), of Strassburg, architect to the French government and member of the municipal council, died 1864 or 1865, aged 60. DALY, *Revue Générale*, 4to., 1865, xxiii, 91.

WEYER (JOHANN PETER), in 1822 became *baumeister* of Cologne, where 1824-6 he designed the palais de Justice and several other buildings. He made the drawings for BACHEN, *Twenty-four sheets of views of Cologne*, lith. by Wunsch, with aphorisms of its history by Lenzen, Col., 1827-8. Also two views of the *tempel-haus* before and after alteration, appeared by SCHIEFER in "Wochenblatt des Gewerbe Vereins", fol., 1840. The date of his death is not found. 68.

WEYRAUCH (JOHANN), 1487 completed the vaulting of the stiftskirche at Heiligenstadt; commenced 1333 by J. Thene and P. Arnknecht. 92.

WEYRER (STEPHAN) of Noerdlingen, succeeded H. KUGLER, and as *baumeister* 1495-1505 completed the fine vaulting of S. Georgskirche there. 1511-25 he designed the beautiful *sacramenthausehen* executed by Ulrich Creitz. Weyerer died 1528. His son of the same name, also a *baumeister*, died in 1542. FIORILLO, *Geschichte der zeichnenden Künste*, 8vo., Hannover, 1815-20, i, 337. KUGLER, *Geschichte*, 8vo., Stutt., 1859, iii, 348. 1. 68. 92.

WEZ (LAURENT DE). See DEWEZ (L. B.).

WHARF. A levelled surface, terrace, or embankment, formed on the bank of a river or canal, or sea coast, to facilitate the landing and embarkation of persons and goods, and protected by an artificial frontage or structure of masonry, brickwork, or timber work, further protected by sheet piling if necessary constituting a wharf wall. The vertical outline is either a slope or batter towards the base, and is either plane faced, curved, or perfectly vertical. The Brunswick wharf at Blackwall, affords a good example. Water cements must be used; the thickness of the wall depends on the ground behind; ties secured to the front of the wall to extend backward, and be secured to a row of piling driven into the solid ground or a mass of concrete. At the back of the wall should be a body of concrete or well-puddled clay. Water currents must be drained away or stopped back. SIBLEY, *New Mode of Constructing Wharf Walls without the aid of coffer dams*; *BUILDER Journal*, 1843, i, 329. PLUMBE, *Requirements of Riverside Construction*, in *BUILDING NEWS Journal*, 1869, xvi, 271-2. Several papers read at the INST. OF CIVIL ENGINEERS, Index, s. v. Quay. WATER, building in. CYLINDER. CRADGE. QUAY. 5. 14.

WHATLEY, WHATTLEY, or Whatteley (JOHN). 1444-45 he was appointed chief carpenter and disposer (DEVISOR) and surveyor of the king's works at the palace of Westminster and the Tower of London, with a yearly fee of £20; succeeding J. Golding. *Patent Rolls*, 23 Henry VI, quoted in BRAYLEY AND BRITTON, *Palace of Westminster*, 8vo., 1836, p. 314.

WHEAL. The ancient Cornish people called a mine *huel*, corrupted into wheel.

WHEBLE'S READING ABBEY CONCRETE, or rubble stone. This was stated (1862) to be an admixture of prepared lime of greater adhesive durability than any cement yet known, used in certain proportions with gravel, stone, chalk, sand, clinkers, or fragments of old bricks. The bricks are formed in moulds, as well as in blocks of extreme hardness, with a surface like stone; also pressed for mouldings, pipes of all sizes, for steps and landings, floors, sinks, sills, etc.; and that it resisted moisture, heat, cold, and pressure. A brick made of Bridge-

water stone lime was found equal in strength to a common stock brick; some specimens did not attain the strength of concrete except where large gravel or flint was the chief ingredient. 1.

WHEEL. See BELL CAGE. TRACE WHEEL.

WHEELBARROW (Fr. *roulotte*). The invention of this implement has been attributed to Pascal; also to Dupin, of France, in 1669; but VIOLLET-LE-DUC gives an illustration taken from a vignette of a MS. of XIII cent., of a man propelling a wheelbarrow, the form of which differs but slightly from those now in use. Others are shown in MSS. of XIV and XV cents. GUENEBAULT, *Dict. Icon.*, 8vo., Paris, 1843, i, 181, notices instances of 1544 and of XV cent. HOD. BACK BASKET (Fr. *hotte*).

It is an appliance generally used for carrying soil in the formation of excavations. Before a roadway is formed, the barrow is run along a line of planks, and also afterwards—for wheeling planks should always be used. The "centripetal barrow" of Windus, has the wheels in the centre instead of at the sides; ILLUSTRATED LONDON NEWS, 1851, xix, 363. Wilson's barrow having the wheel under it, is described in CIVIL ENGINEER, ETC., *Journal*, 1853, xvi, 368; PRACTICAL MECHANICS *Journal*, 4to., Glasgow, 1853, vi, 232; and BUILDER *Journal*, 1853, xi, 635. A French invention with three wheels is described in *idem*, 1859, xvii, 608. A new form, the legs being bolted to the frame and meeting on the ground, has a cut in BUILDING NEWS *Journal*, 1872, xxiii, 306. The body of the "excavator's barrow" is spread wide open, and the sides very much inclined, so as to leave a slight projection only from the bottom, the centre of gravity of the load is, therefore, situated much lower in respect to the handles than in the ordinary barrow, which renders it more steady, and easier to wheel. The contents may also be discharged quickly by inclining the barrow at an angle of 45°, and supporting it constantly on the wheel, without the man being required to alter his position, or to loose his hold of the handles. The iron nave of the wheel is prolonged on each side, and serves for an axle, and the periphery is not above 1 inch in thickness round on the edge; BREESE, *Illustrated Glossary*, 8vo., 1853. It is made with ash frames and inch elm tops. BREESE, *Railway Practice*, 3rd Series, 4to., 1847, pl. 8, shows one. There are also the "garden" or "common"; the "separating"; "new ground work"; "Normandy"; "flower pot"; "water"; and "hand" barrow; LOUDON, *Encyc. of Gardening*, etc., 8vo., 1850, p. 551-2. A wrought-iron wheelbarrow with steel body is also now made.

WHEEL WINDOW (It. *oculi*, round window; Hindoo, *chakra* from the Trisul emblem). A traceried round window of less complication than the "rose", or those to which the term "marigold" is applied. It is also called "Catherine" wheel. It has been, from its circular form, accounted a symbol of divine providence; the four at Amiens cathedral are regarded as typical of the four elements. A "wheel of fortune" of twelve lights radiating from a centre foliated circle, executed 1138-78 by Briolotus in the west front of the church of S. Zenone at Verona, is recorded as the parent or progenitor of all others; MAFFEI, *Verona illustrata*, 4to., Ver., 1731, iii, 135; *Handbook to North Italy*, 8vo., 1842, p. 286a; 1846, p. 272. 1247-8, 32 king Henry II ordered a new mantle to be made in his chamber at Clarendon, and on it to be painted the wheel of Fortune and Jesse; TURNER, *Dom. Arch.*, 8vo., Oxford, 1851, p. 215.

At the west end of the hall of the XIV cent., and sometimes at each end, there was a window in the gable—frequently round—continued from the previous (XIII) century, where in Dublin castle the hall (after that at Canterbury) was 1242-3 to have in the gable over the dais a round window thirty feet in circumference. The window at the hall of the old palace of the bishop of Winchester, at Southwark, considered by J. Carter to have been the noblest in England; S. John's hospital at Northampton; and the palace at S. David's, are given by TURNER and PARKER, *Domestic Architecture*, 8vo., Oxford, 1851-9, i, 259; ii, 37, 93; as well as the framework of a table, perforated in this

form, from a "Romance of Alexander", MS. 264, in the Bodleian library. A list of windows is given s. v. ROUND WINDOW.

Oporto cathedral. A west marigold window of eight lights has an immense and most effective splay. Church of S. Francisco, has a very singular marigold west window.

Assisi; (p. 109), in the arch head of the doorway to middle or the lower church as usually called.

Oxford. The Catherine wheel in north window of Merton college chapel, is stated to be one of the only three now in England.

Illustrations, s. v. Window, circular, from Spoleto cathedral; Sta. Chiara at Naples; S. Francesco at Assisi, and Taormina, in Sicily.

WHEELER (JOHN), was county surveyor for Gloucestershire, and 1791 worked out the design of sir G. O. Paul for the county gaol.

WHEELING. The removal of ground by a barrow; "filling the barrow and wheeling for the run of 20 yards", is a first charge; and for each 20 yards further, an additional charge is made. SEDDON, *Building Trades and Building Construction*, fol., Chatham, 1877, 2nd edit., p. 4, gives much useful information hereon.

WHEELING STEPS. The Scottish term for "winders" of stairs.

WHEEL TRACERY in geometric windows; without a central figure; its foil form; its effect in flowing tracery; and centre pieces in subarcuated flowing windows, are explained in FREEMAN, *Window Tracery*, 8vo., Oxford, 1851.

WHELMER and kneeler. The former is the drip stone, the latter its return. 1617 and 1618, "Cornises and kneelers over everie window of free stone." "Wheeler and kneeler"; the former term is the level stone of a battlement, the latter term the upright; WILLIS and CLARK, *Arch. Hist.—Cambridge*, 4to., Camb., 1886, i, 205; 207; iii, 621. KNEELER.

WHELPDALE (WILLIAM), "1485, freemason fore making of the cross in the Chirchth, 0. 5. 0; and 1487-8 Thomas Whelpdale mason for mending divers defaults withyn the church and withouten rounde aboute 0. 10. 8." NICHOLS, *Illustrations of the Manners, etc.*, 4to., 1797, Churchwardens' Accounts of Wigtoft, Lincolnshire.

WHETELAY (ROBERT), warden of the carpenters at Eton college, Buckinghamshire, had 1440 a warrant from the king to take workmen and others for the works; and 1443 bishop William of Waynflete the "surveyor" contracted with him to execute carpentry work there. BENTLEY, *Excerpta Historica* 4to., 1831, p. 46; WILLIS and CLARK, *Arch. Hist.—Cambridge*, 4to., Camb., 1886, i, 389. WESTERLY (R.).

WHETTEN (THOMAS). A pupil of sir William Chambers; 1771 gained the silver medal of the academy of arts in London (GENTLEMAN'S MAGAZINE, lxxxii, pt. 2, p. 237); and 1774 the gold medal. He exhibited at the academy from 1774 to 1784. In 1788 he was paid thirty guineas for designs for the council-room at the exchange at Liverpool; PICTON, *Municipal Records*, 4to., 1886, ii, 265-6. His name is the only one with "architect" attached in the list of subscribers to ALDRICH, *Elements of Arch.*, 8vo., 1789. He designed the rebuilding of No. 5, Berkeley square, for messrs. Gunter. He died in ...

WHICHCORD (JOHN), born 1790 at Devizes, where his father practised as a surveyor; articulated 1806 to C. H. Masters of Bath, and entered the office of D. Alexander of London, who employed him at the London docks and the gaol at Maidstone; and to whom Whiccord succeeded in much of his practice. He was appointed surveyor for the county of Kent; designed the Union house at Bletchingley; 1842 Blindley Heath church (BRAYLEY, *Surrey*, 4to., 1841-8, iv, 144); the large county lunatic asylum for Kent; the churches of the Holy Trinity, and S. Philip; the corn exchange, the Kent fire office, and other buildings, all at Maidstone; fifteen union poorhouses in various parts of the country; a large number of parsonages; was appointed surveyor to the Medway Navigation company and executed on that river several extensive hydraulic works, some tidal locks, and a number of bridges; 1842 with ... Walker, he

designed the new church at Platt, near Wrotham (CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 439); 1847 with his son, West Wickham church; and with Blandford, the Kent county prisons at Canterbury (tenders in *BUILDER Journal*, 1859, xvii, 180). He died June 10, 1860, aged 70, at Maidstone. *BUILDER Journal*, 1860, xviii, 383.

WHICHCORD (JOHN), F.R.I.B.A., F.S.A., F.I.S., born November 11, 1823, at Maidstone, son of the above, became 1844 student at the royal academy, and assistant to his father. In 1846 he went to Italy, the Ionian islands, Greece and Turkey, Syria, to the Euphrates, Egypt; and 1850 France, Italy, Germany, and Denmark. On his return he entered into partnership with A. Ashpitel until 1858. In 1852 additions and decorations to Birling manor-house, Kent, for earl of Abergavenny; 1854 he was appointed district surveyor for Deptford. He designed 1858 fourteen houses on the Mount Elliott estate at Lee, Kent; large blocks of offices, as 1859-60, No. 9, Mincing lane; No. 24, Lombard street; No. 8, Old Jewry; Mansion house chambers, Queen Victoria street; Brown, Janson & Co.'s banking house, Abchurch lane; the Grand hotel, Brighton; the Clarence hotel, Dover. S. Mary's church and parsonage at Shortlands near Bromley, Kent; and laid out the estate for building; 1874 S. Stephen's club-house, Westminster bridge (*BUILDER Journal*, xxxii, 308-11); National safe deposit company's premises, Queen Victoria street; and New Zealand banking house in the same street; also the internal fittings of the new houses of parliament at Cape Town. He wrote *History and Antiquities of the Collegiate Church of All Saints, Maidstone*, 4to., 1845. *Kentish Ragstone as a Building Material*, 8vo., 1846. *History and Antiquities of S. Mary Aldermanbury, Bow Lane*, 8vo., 1849. *Sanitary Condition of Maidstone*, 8vo., 1849. *Antiquities of Maidstone and Polychromy of the Middle Ages*, 8vo., 1854, in Weale's Quarterly Papers on Architecture. With ASHPITEL, *Baths and Washhouses*, 8vo., 1853; and *Town Dwellings, or Erection of Fireproof Houses in Flats*, 8vo., 1855; and besides the paper on *Ragstone*, read Dec. 1845, he gave *Hydraulic Lifts* January 1864; and *National Safe Deposit Company's premises*, January 1876, at the Roy. Inst. of British Architects, of which society he was president from May 1879 to May 1881, and delivered *Addresses*, 1 Dec. 1879, and 1 Nov. 1880. He died January 9, 1885, aged 61, and was buried in the cemetery at Kensal Green. *BUILDER Journal*, 1885, xlviii, 98.

WHIM. A machine used for raising ores, etc., worked by horses, steam, or water.

WHIN or broom. See PLANTA GENISTA.

WHINSTONE. The name by which the marl of the lower greensand is distinguished in West Sussex; a term probably of Saxon origin (MANTELL). "Whinstone trap" differs from moorstone in that the former contains iron and also some lime. It is only slightly absorbent. A bridge of whinstone, erected at Ashiesteel, by J. and T. Smith of Darnick, 131 ft. 6 ins. span, was supposed to be the boldest arch formed of this material. *Whinstone Construction*, by J. and T. SMITH, read at Roy. Inst. of British Architects, 4th January 1836; and the bridge, on 18th Dec. 1848: extracted in *BUILDER Journal*, 1849, vii, 34; 63 elevation; 101. HOLLOW WALL. The courtyard of the residence at Alloa of the earl of Mar is lately paved (1854) with whinstone, all wrought flat on the upper surface and neatly jointed at the edges; each about 8 ins. by 5½ ins.; wrought at Queensferry. "Whinstone pavers and blocking course" (1877) from Darlington.

WHIP LAND. Land not divided by meres, but measured out, when ploughed, by the whip's length.

WHIPPING-POST. See STOCKS.

WHISPERING PLACE. A passage or gallery so called in consequence of the facility and distinctness with which a whisper or other low sound is transmitted through its whole extent. In England there are two well-known examples. 1. At the east end of Gloucester cathedral, being a passage above the choir and behind the great east window, of three sides of an

irregular polygon and two legs, of about 20 yards, 3 ft. wide, 6 ft. 3 ins. high at the two ends rising to 8 ft. 4 ins. in the middle length; two whisperers can hear each other at 75 ft. distance; EVELYN, *Diary*, July 31, 1654; BIRCH, *History of the Royal Society*, 4to., 1756-7, i, 120; drawing, etc., by Mr. Powle, related in *UNIVERSAL MAGAZINE*, 8vo., 1756, xviii, 169; RUDDER, *Gloucestershire*, fol., Circen., 1779, p. 178. The other is the circular internal gallery of the dome of S. Paul's cathedral, London, above the main cornice. Others are at the lecture-room, University college school, Gower street, which is a half circle. If a pin be dropped into the well at Carisbrooke castle, in the isle of Wight, the sound of its striking the water is distinctly heard at the mouth; the well is 145 ft. deep, and not 200, 300, or 600 ft. as often stated. In the capitol at Washington, in two places, are whispering galleries; one at the top of the dome, and the other in what was the Representatives' first room. In the latter the air is forced through the long corridors, and, as it enters the room, it is carried up against the arches, and this being cold marble condenses the moisture in the air, forming a swirl of vapour which is held in the angle where the arch joins the ceiling, and this forms a regular speaking-tube. Persons standing in opposite corners can converse in an ordinary tone, while those standing between cannot hear even a sound. The same result occurs in the dome, produced by a similar cause. The crypt of the Pantheon at Paris. The alcoves on old Westminster bridge where the voice was heard across it.

The "ear of Dionysius" at Syracuse. The famous one at Giregenti. Across a chamber, at the baths at Baie; *Handbook to Southern Italy*, 1853, p. 397b; SARNELLI, *Guida per Pozzuolo*, 12mo, Naples, 1697, p. 163. Another, a square chamber, one of the apartments of the queen-mother in the palais du faubourg S. Germain; SAVOT, *L'Arch. Franç.*, edit. by Blondel, 8vo., Paris, 1685, p. 182-3. HUTTON, *Mathematical Dictionary*, 4to., 1795, s.v. Whispering places. T. R. SMITH, *Acoustics*, 12mo., 1861. Echo. At Fraconni's circus, Champs Elysées, Paris, the sound rolled slowly about the circle of the building in a maddening manner, causing a most deplorable confusion of harmony in even the most slightly intricate composition; H. BERLIOZ, *Autob.*, 8vo., 1884, ii, 169. 1.

WHIT BED. See PORTLAND STONE.

WHITBY CEMENT. The same as ATKINSON'S CEMENT. ROMAN CEMENT.

WHITBY STONE. A stone of the millstone grit series extending largely over various parts of Yorkshire, Lancashire, and Derbyshire, and obtained from the Aislaby, Darley dale, and Eytton quarries. Bolton's Whitby Crag Moor stone has been used (1865) at all the principal churches, chapels, and mansions throughout Yorkshire. A softer description of the Bramley Fall stone (though not a good weather stone) is worked at Whitby and called New Bramley Fall (1875). The mean crushing strain of Bramley Fall, on a 6-inch cube, is 265.7 tons per foot sup. THE INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, records the samples of fractures, etc., by S. KING, *On the Strata of Stone*, March 6, 1838, p. 20. The Whitby Stone company described this material at the Roy. Inst. of Brit. Architects 26 Feb. 1838. WINTER, *History of Whitby*, cir. 1814. REED, *Illustrated Guide*, 6th edit. ROBINSON, *Whitby Abbey*, etc., 1860. *BUILDER Journal*, 1860, xviii, 525. 1.

WHITCHURCH SANDSTONE. A fine grained sandstone of which the new bridge at Gloucester was built; the parapets being of Ruordean stone; *Report of the Commissioners on Stone*, 1839; 2nd edit. 1845.

WHITE (JOHN), surveyor to the New River company from Ladyday 1691 to Midsummer 1723; he died in 1741, and was buried in Enfield churchyard, with a curious inscription; given in LYSONS, *Environns of London*, 4to., 1795, ii, 309. BREWER, *London and Middlesex*, 8vo., 1816, p. 738.

WHITE (JOHN), of Hampstead, died in 1813 as stated on the family vault in the cemetery on the north side of Paddington street, Marylebone, of which now (1891) only part of the head-

stone is to be seen. It was probably his son JOHN who 1775 designed gratuitously the Marylebone workhouse; appears as a subscriber to T. MALTON, *London and Westminster*, fol., 1792; 1793 made a plan for the improvement of the parish; and he held the appointment of architect to the duke of Portland; 1812 "presented the vestry with a design for a double church upon a new principle accommodating a large number of persons, and a magnificence of exterior", which is published in his *Proposed improvements of the western part of London, by the formation of the Regent's Park, the new street, sewer, etc.*, 8vo., 1814; 2nd edit., 1815, in which he refers to his plan in the *Triennial Report*, Dec. 1, 1797, by Fordyce, surveyor-general of crown lands, and gives the plans of Leverton and Chawner, and by J. Nash. The date of his death has not been found. SMITH, *History of Marylebone*, 8vo., 1833, p. 87.

WHITE (JOHN), son of the above, is mentioned in the above work, and so may have (or his father) taken out January 15, 1824, a patent for a floating breakwater; 1823 competed for London bridge; published *On Cementitious Architecture as applicable to the construction of Bridges; with . . . first introduction of iron . . . for arches of large span* by T. F. Prichard in 1773, 8vo., 1832; designed the Eyre Arms tavern and assembly rooms, S. John's wood; and 1836 competed for the new houses of parliament. In July 1845 the *BUILDER Journal*, iii, 367, published a letter from him with cuts showing picture-galleries with side-roof lights close to the wall, an arrangement he had suggested to B. West, R.A., when he altered his gallery (cir. 1800) in Newman street, a great success. White held the appointment of district surveyor for the parish of S. Marylebone from before 1810 to his death (date unknown), but after 1852. JOHN ALFRED or ALFRED WHITE succeeded as district surveyor for S. Marylebone north, and resigned 3rd April 1858.

WHITE (THOMAS), apprenticed to a statuary and stone cutter in Piccadilly, was taken (! sent) to Rome by sir C. Wren for study, where he measured the component parts of S. Peter's and assisted Wren in the model of S. Paul's, "still shown there". On his return to England, he retired to Worcester having property there; and 1718 designed and 1721-3 carried out the town or guild-hall, for which he received a pension of £30; also carved the statue of queen Anne, and parts of the two Charles's, with other works named by GREEN; 1728-42 designed the churches of S. Nicholas, S. Swithin, and All Saints (ASSOCIATED SOCIETIES, *Reports and Papers*, 1857-58, p. 333-5, and 1862, p. 238). He died 1736 or about 1738. GREEN, *History of Worcester*, 8vo., 1764; 4to., 1796, ii, 89. NASH, *Worcestershire*, fol., 1781-99, ii, App. cxvi.

WHITE. The opposite to BLACK; the colour most significant of light. The chief colour for all great feast days as being the most joyous; as generally employed in the western countries. Its varieties are—Snow white, as represented by Carrara marble; and arragonite: Reddish white, by varieties of calc spar and quartz; dolomite: Yellowish white, by varieties of calc spar and quartz: Greyish white, by granular limestone; and Milk white, by opal. ANSTED, *Geology, etc.*, 8vo., 1850.

WHITE BRICK. An early instance of this material occurs at Copped hall, Essex, seat of John Conyers, 1753-57 designed by James Wyatt, built of white bricks, is admired for the closeness and neatness of its jointing, and for the squareness and symmetry of the bricks which were all cast in iron moulds; BRAYLEY and BRITTON, *Beauties of England*, 8vo., 1803, p. 430. The white Woolpit bricks are obtained from the eastward of Bury S. Edmunds, Suffolk; the Suffolk white brick is cold in tone. Cowley in Oxfordshire, sends "best yellow and white cutters; yellow and white seconds." Pickwell's patent pressed white brick, manufactured at Hull, Yorkshire, is sound, with uniform colour, and is stated to resist frost and the action of acids much longer than others. Beart's patent bricks made at Ardsley, near Hitchen, from the GAULT clay, are known by being pierced through the thickness by small perforations. From some cracks appearing in a house about three years after it was built, it was

concluded that the mischief was to be attributed to the swelling or heaving of the white bricks used, perforated ones being used for the front, and ordinary solid hand-made ones for the back and sides; *BUILDER Journal*, 1866, xxiv, p. 238.

White glazed facing bricks are made near Leeds, near Gainsborough, at Ruabon in north Wales, Tamworth, and other places. These are used in lieu of glazed tiles for promoting the reflection of light, or for obtaining a surface on outside and inside walls to be easily cleaned. Some are provided with patterns for decorative purposes, and are made in various colours as well as white. GLAZE. 1.

WHITE CANON. See PREMONSTRATENSIAN ORDER.

WHITE CHALK or white limestone. From it both lime and whiting are prepared. CHALK. CLUNCH. WHITING.

Underlying the trap rocks in Autrin, and appearing in most parts of the coast, is the white limestone or chalk. This rock, however, though geologically identical with the chalk of England, is of very different character from it. It is a very indurated, compact, occasionally crystalline, and brittle stone, chiefly valuable for its good strong lime; though sometimes used for walls of houses, the blocks being scabbled; from being full of irregular veins or joints, it is only obtainable of a very moderate size. Along the eastern coast it is largely exported to Scotland for burning lime; WILKINSON, *Geology, etc., of Ireland*, 8vo., 1845, p. 340. WHITE STONE.

The material used by artists as a crayon, one of three "drawing chalks", is a white chalk, a carbonate of lime carefully prepared.

WHITE COPPERAS and vitriol. A sulphate of zinc; an old drier, either mechanically ground, or in solution for use for light colours.

WHITE DEAL and PINE. *Pinus abies* or *ABIES excelsa*, Norway spruce fir, and American black, red, and hemlock fir. It is yellowish white in colour. Christiania, Friedrichstadt, Drontheim, Gottenburg, Petersburg, and Riga, all supply white deals. Spruce fir sent 1862 from Norway, presented in the sections nearly all one colour, and the thin bark; the Scotch fir, also sent from Norway, was of two colours, and thin bark; the centre portion being the darkest and the largest in diameter.

Pinus strobus, Weymouth or American white pine, called yellow pine, as it becomes brownish yellow when seasoned. The Schuylkill bridge at Philadelphia, and the Delaware bridge at Trenton, were built of it. Brunel used it for the longitudinal sleepers on the Great Western railway, it was considered a very bad selection, even though afterwards creosoted; it has little strength, the nails hold feebly, and swells with the atmosphere; it is soft, light, durable, free from knots, easily wrought, and does not split easily in the sun. The boards being of great width are useful for panels; chiefly for joiners' and cabinet-makers' work.

There are other "white woods", as birch, cedar, gum, walnut, horse-chestnut, and some foreign woods. *White wood*, in BUILDING NEWS *Journal*, 1879, xxxvi, 648. *Red and white pine*, *idem*, 1874, xxvi, 272.

WHITE FRIAR. An order of monks; see CARMELITE. The first house in England was established at Aylesford, in Kent.

WHITE GLASS. In 1773 this in France was called "verre de Bohème"; BULTEAU, *Descr. de la Cath. de Chartres*, 8vo., Chartres, 1850, p. 208. It was used by the Cistercian Order, which was forbidden to used coloured glass; ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1885, p. 45. GLASS. MANGANESE.

WHITE GRANITE. See GRANITE (p. 77).

WHITE IRON. A low temperature and a deficiency of fuel produces white cast iron; it is silvery white, either granular or crystalline, comparatively difficult to melt, brittle, and excessively hard. It is a homogeneous chemical compound of iron with from 2 to 4 per cent. of carbon. Crystalline white cast iron is harder and more brittle than granular, and is unfit for use in structures, and is not capable of conversion into grey cast

iron by fusion and slow cooling. It is said to contain more carbon than granular white cast iron. 1.

WHITE LEAD. See WHITE PIGMENT.

WHITE LIAS STONE. See LIAS.

WHITE LIME. See LIMESWHITE. WHITEWASH.

WHITE MARBLE. A pure white marble used by the ancient sculptors. Among them was Parian, which held the first rank, obtained from mount Marpesus, in the island of Paros. Marmor Porinum (It. *Grechetto Duro*), or Chernites, was used for sarcophagi; marmor Pentelicum (It. *Greco Fino*); marmor Hymettus (It. *Imezio* or *Cipollo*); marmor Lesbium (It. *Greco Giallognolo*); marmor Tyrium (It. *Greco Turchinicio*); marmor Lunense, in Etruria; marmor di Carrara; marmor Coralicum, also called Sangarium (It. *Palombino*). Others as Trojan, Mylasian, and Ephesian; Phellense; Cyzicum or Proconessian; BURNHAM, *Limestones and Marbles*, 8vo., Boston, U.S.A., 1883. BRINDLEY; *Marble; its uses as suggested by the past*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1887, iii, new series, p. 45, Greek; the great sea wall of Constantinople built for long distances with continuous slabs of white marble between 3 and 4 ft. square (p. 48), being old materials; slabs round the central pavement of the Basilica Julia, at Rome; and white squares in pavements in England from Italy. The white marble of Falcovaja is very good. Quarries at Monte Altissimo were opened by Michael Angelo, and the material used by sculptors: other quarries for the church of S. Isaac at S. Petersburg; and for Santa Croce at Florence. Milan cathedral is built of the white marble of Monte Candoglio or Candido, on the river Toce, selected as better fitted to stand the atmosphere than that of CARRARA of which it is usually said to be built; most of the statues are new.

In France a block weighing 10,000 kils. was moved from quarries at Laveline (Vosges) to Epinal, for the base of the statue of duc de Belluno, at Lamarche near Epinal, where he was born; 1846. At Lyon the so-called white marble used by the Romans, is a calcareous stone, *Choin antique*, obtained at Fay near the city; BEARD, *Minéralogie*, 8vo., Paris, 1821, ii, 15. A white marble from the Hücklestrand quarry in the Ofoten fiord in Norway, is introduced in the junior Constitutional club building in Piccadilly, designed by R. W. Edis, F.S.A. (1897).

White marble is obtained at Connemara, and in Donegal, in Ireland. The former is hard, fine, and strong; the latter is so coarse that it cannot be used for fine work. The former cannot be procured in large blocks free from streaks, which pass through the blocks parallel with the beds. The chief quarries are at Churchtown, Doneraile, Kerry, Tipperary, Connemara, and Donegal.

WHITE MASON. See MASON.

WHITE MONK. An order of monks; see PREMONSTRATENSIAN; and CISTERCIAN.

WHITENING WORK. See LIME-WHITING, and WHITE-WASHING.

WHITE PAINT or PIGMENT. The earlier Grecian masters used the earth of Melos for white. The Romans used a thick white, called *Ammonium*, or *Paratonium*, from Egypt on the shore of the Mediterranean sea; it was also used for stucco. *Annulare* was another sort for flesh colour; chalk and glass (*annuli*) mixed. *Cerussa*, or white lead also used in flesh; not in fresco work. *Erctria* supplied a white earth, coloured for light blue. *Creta argentaria* was steeped in a dye for purple; POMPEII, by Soc. for Diff. of Useful Knowledge, 8vo., 1832, ii, 52-8. Ceruse, Cremnitz, Dutch, Flemish, Hamburg, Venetian, and Roman, white lead, are all carbonates of lead or plumbic carbonates. Cremnitz is usually pure; it is the whitest of white leads. Dutch has 24 per cent. of white lead and 75 of baric sulphate. If they contain hydrate of lead the components of water are present. Hamburg is two parts of heavy spar with white lead. Venetian is sulphate of barium and carbonate of lead in equal parts. *Flake white* (when levigated called body

white) is oxydised carbonate of lead; it has the best body of all white leads. *Blanc d'argent*, or silver white, or French white, is a white of lead, with less body than flake white. *Baryta*, or constant white, or Permanent white, is a sulphate of barium or Baric sulphate, and called Heavy-spar when found native. Barium 137, sulphur 32, oxygen 64 equivalents, this is the neutral sulphate. Constant white occasionally consists of carbonate and sulphate of Barium. Sometimes it is not entirely freed from sulphuric acid. *Zinc white* or Chinese white. STANDAGE, *Artist's Table of Pigments*, fol., 1883.

White lead (Angl.-Norman, *litarge*; Lat. *minium*; *Ceruse*, Krems; Ger. *bleiweiss*), is a well-known pigment, which when ground in linseed oil is used in general painting. It is a carbonate of lead, generally containing hydrated oxide of lead, sometimes combined in the proportion of one atom of the latter to two of the former. The several modes of manufacture need not here be detailed. The ancient Rhodian method is related by VITREVIUS, chap. vii, xii, and xiii. The Venetian method is explained in ROYAL SOCIETY, *Philosophical Transactions*, before 1705, by sir Phil. Vernatti. The usual or Dutch method in HUNT, *Handbook to Exhibition* 1862, 8vo., 1862, i, 78. *London and Nottingham whites*. The best of these do not differ in any essential particulars materially, nor from the white leads of other manufactories. The latter being prepared from flake white is generally the greyest of the two. The inferior white leads are adulterated with whitening, sulphate of barytes, or other substances, which injure them in body and brightness, dispose them to dry more slowly, to keep their place less firmly, and to discolour the oil with which they are applied. All the above are carbonates of lead, and liable to froth or bubble when used with aqueous, spirituous, or acid preparations. There are no better whites for architectural painting; and for all the purposes of common oil painting they are kept in shops under the names of "best" and "common" white lead ready ground in oil, and require only to be diluted with linseed oil and more or less turpentine according to the work; and also for mixing with other colours and producing tints. 7.

Old ground white lead ("genuine" is the trade term for real white lead) in pure linseed oil is now difficult to be obtained and is rarely used except perhaps by the best house painters. For all practical purposes genuine white lead exists only in name, imitations being used by the trades. In 1852 it was stated by D. G. Laing that he, in 1838 while engaged in testing a white paint made from the refuse of litharge, for the Society of Arts, was first made acquainted with a process of clarifying and cleansing linseed oil by means of sulphuric acid, a process prejudicial to the oil; and with oil adulterated with the cheaper oil of resin and pine, which causes white lead when ground to appear very white; adulteration is also described in BUILDER *Journal*, 1852, x, 182; 1856, xiv, 92, 133; and with *baryta*, xxi, 51, which gives the amount as carbonate of lead 53.2, sulphate of baryta 38.8, and of oil 8.

ANTWERP. BISMUTH. BLANC D'ARGENT, or Silver, or French. BLANC D'ESPAGNE, or SPANISH, or TROYES. CERUSE. CHINA. CHINESE. CREMS, KREMS, Kremnitz, or Vienna. FLAKE or Body. FRENCH. London. Nottingham. Permanent, or Constant, or BARYTIC. ROMAN. ROUEN. TIN. Venetian. WHITING. ZINC and its varieties. WINSOR and NEWTON, *White Pigments*, 8vo., 1837. BUILDING NEWS *Journal*, 1870, xviii, 191. LAURIE, *Oils and Varnishes*, at SOCIETY OF ARTS, *Journal*, 10 April 1891, p. 392.

Other salts of lead which have been proposed to replace the carbonate, such as the sulphate of lead with excess of oxide, although equal in whiteness and opacity, have generally been found comparatively deficient in some other property when brought into use. Such substitutes have proved over-sensitive to sulphuretted hydrogen; or their excess of oxide appears to combine with the oleic acid and produce a paint which is streaky under the brush, or does not "flat" well; and the remarkably small quantity of oil necessary to liquefy the carbonate of lead

(a gallon of oil to the hundredweight of white lead) is apt to be exceeded. A new substitute (CIVIL ENGINEER, ETC., *Journal*, 1849, xii, 115, 301) by H. Lee Pattinson, using the oxichloride of lead, consisted of single equivalents of chloride and oxide of lead; but its manufacture had been given up by 1877. A white paint made from oxide of antimony was not apt to lose its colour, and would spread over a larger surface than an equal weight of white lead paint; 1848. "Hannay's white lead" is made direct from the ore, which is placed in a furnace with live coke, and by the action of a blast of air is driven into vapour and oxidised to sulphate of lead, which is collected by a special condenser, washed with a dilute acid and dried. The white is obtained in a state of fineness exceeding that obtained by grinding. "Gardner's patent process" consists in making white lead of the finest quality chiefly by electricity; this is explained in *THE SANITARY RECORD Journal*, for 15 Oct. 1883, p. 223. The "Innocuous" white lead company limited was formed March 1881 for its manufacture under a perfectly innocuous system, as certified by her majesty's inspectors of factories, so as to lessen the illness and mortality occasioned by making white lead under the usual systems. In addition the company claim to produce a genuine white lead at a saving over that obtained by the ordinary method. "Orr's Charlton white", Torbay white, and zinc white, are called rivals to white lead, and as being innocuous in character, unchangeable in colour, economic and durable. Freeman and Co.'s patent "non-poisonous white lead paint", is innocuous, retains its colour, superior in body, colour, and density, readily mixes with oil, is free from the smell of white lead; 1885. "A new process of manufacture"; *Journal of the CLERK OF THE WORKS ASSOCIATION*, Sept. 1889, p. 244; *BRITISH ARCHITECT Journal*, July 18, 1890, p. 54. 71.

White lead paint is discoloured by sulphuretted hydrogen or foul air; in small quantities it changes it to a dirty brown, and in large quantities it becomes completely blackened. The oil in the paint is decomposed by the action of the oxide of lead in the white lead, and after a long time an interchange takes place between the acids of the oil and the acid of the carbonated lead; BARFF, in *SOCIETY OF ARTS Journal*, 8vo., 1877, p. 254, and *BUILDER Journal*, 1877, xxxv, 179. To prevent white paint when excluded from the light from turning yellow; B. J., 1875, xxix, 50. The action of sulphide of lead on paint; B. J., 1865, xxiii, 663. Thénard found that oxygenated water, containing not more than five or six times its volume of oxygen and had no taste, applied with a pencil to discoloured white paint instantly restored it, by converting the black sulphuret of lead into a white sulphate; *ANNALES DE CHIMIE*, xiv, 221; *QUARTERLY JOURNAL*, No. 19, 1820, p. 169.

White sand and white paint mixed rather thicker than for common use, dries very hard, and is good cement for joints in woodwork; DOWNING, *Country Houses*, 8vo., New York, 1850, p. 189. Whiting mixed with water made so as to taste just sufficiently of salt, forms the best cement for using to joints of ironwork when it comes in contact with fire; 1842.

WHITE SMITH. A worker in tinned iron, or white iron, who finishes and polishes the work, in distinction from those who forge it.

WHITE STONE. A term word for CLUNCH, a material extracted from hard beds low down in the chalk, and much used in building and carving work in Cambridgeshire; BONNEY, *Cambridgeshire Geology*, 8vo., Camb., 1875, p. 75. MANSFIELD STONE. WHITE CHALK.

WHITE PAINTING. See CHIFOLIN PAINTING.

WHITE TILE. See WALL TILE.

WHITEWASH. A term applied somewhat indiscriminately to two materials. The one being made of WHITING, the other of LIME. The first is used in interior work only as DISTEMPER for decoration; the other for outside work, and in interiors of rough places for cleanliness and sanitary purposes. Whiting, or Spanish white as it is also called, is broken

ARCH. PUB. SOC.

into water to which is added strong size whilst warm; when cool it should appear as a thin jelly, and is applied with a broad brush. All washes absorb water, and in damp weather lose their colours. It is said that distemper when once put on precludes the after use of limewash, for the latter when laid on whitening turns yellow (probably if not first washed off). Whitewash, like limewhite, preserves timber. A better effect than a mere white wall is to colour the whitening with a little raw umber for a drab; blue black for a grey; burnt sienna for a light warm red, and so on. The colour may be fixed by the addition of size, say two quarts of thin size to nearly a pailful of the white or colour. Dr. Jacobsen of Hamburg invented a new whitewash, which is said to be as durable as paint. Fifty parts of glue are dissolved in 150 parts of water, add two parts of a solution of caustic soda, specific gravity 1.34, and boil. A flocculent precipitate separates, which may be disregarded. When cool add fifty parts of commercial water-glass solution, and stir in enough oxide of zinc to give a proper consistency for painting. If necessary, the mixture must be passed through a mill to make it smooth. This composition, it is said, is well suited for either wood, metal, or brickwork. Two coats should be laid on, and when they have perfectly dried, a solution containing 10 per cent. of chloride of zinc should be applied. This will give a beautiful gloss, and great durability to the composition; *BUILDING NEWS Journal*, 1868, xv. A wash that can be applied to lime walls and afterwards become waterproof so as to bear washing; Resenscheek of Munich mixes the powder of three parts siliceous rock (quartz), three parts broken marble and sandstone, two parts of burnt porcelain clay, with two parts freshly slacked lime, still warm; applied thickly. *BRITISH ARCHITECT Journal*, 1889, May, p. vii, after 350. "Duresco" is a modern water-paint for outside and inside work, which if applied to walls or plastering upon "petrifying liquid" as the first coat, becomes waterproof so as to bear washing.

Whitewashing or colouring the façade of a building, is easily done on the continent by means of one ladder of a sufficient length, placed sideways to the front; it is secured by a rope from an upper window, for the incline to be lowered or raised as necessary; *LOUDON, Architectural Magazine*, 1837, iv, 387, with a cut.

To remove whitewash. The basis is carbonate of lime, hence nitric acid, or some cheaper compound or dilution may be obtained as a wash. In the *ECCLESIOLOGIST Journal* of February 1847, vii, 41-2, attention was directed to the use at Ely for over two years of the "Manchester card", as being the most useful method. CARD. To paper whitewashed walls; a day or two beforehand, apply a hot and thin solution of common glue to the wall, well saturating it, by means of a common whitewash brush; for the paste, mix the flour with a weak solution of glue, thus avoiding thick paste.

WHITEWASHING. A process of rendering walls and ceilings "sweet and clean", in which whitening is used. Two coats to old and new work are required. The old work requires to be first well washed by a brush and clean water; it is much used for common ceilings; for the better sort DISTEMPER is used. 12 lbs. of whiting, $\frac{1}{2}$ lb. of blue black, and $1\frac{1}{2}$ gallon of size, are required for each 100 yards superficial, done once; and 21 lbs. of whiting, and $\frac{3}{4}$ lb., and $2\frac{1}{2}$ gallons, are required of the other materials if done twice. The black is to modify the intense white of the whitening.

Churchwardens were formerly greatly blamed for "whitewashing" their churches; many no doubt were limewhited, and it is believed that at times this was done for sanitary purposes, for cleanliness, and even for decoration, or from ancient tradition. Thus it is recorded that *cir.* 669, Wilfrid of Ripon "cleansed the walls and made them whiter than snow by means of white lime". *NOTES AND QUERIES Journal*, ix, 148, 286; xii, 194. The Normans did not care for uniformity of colour

in the materials used, because they brought the whole surface to the same tone by plaster or whitewash; or employed it when thus prepared as the receptacle of painting properly so called; —ASSOCIATED SOCIETIES, *Reports and Papers*, 1857, p. 121: while the same *Journal*, 1878, p. 91, states that at the church of S. John Baptist at Halesowen, "the removal, about 1838, of the colour-wash brought to light the varieties of rich colour in the native stone"! In 1210, the sacrist of Peterborough cathedral whitewashed the vaulting of the retro-choir. 1212 several writs of Henry III direct the chapel of S. John in the Tower to be whitewashed (p. 198); Westminster hall for Edward I, and the queen's chamber (p. 189 and 194); Rochester castle (p. 196); the great Tower (p. 197); TURNER, *Dom. Arch.*, 8vo., 1851. The walls of the Cistercian church of Roche abbey were found to have been coloured white, or pale buff, and black lines drawn to imitate masonry regardless of the real work beneath. 1342 at Westminster abbey; 1416 the cloisters at Durham; 1517 at Heybridge church, Essex; 1542 at Ludlow church; 1547 "all churches new whytelimed"; MILMAN, *S. Paul's*, 8vo., 213. Instances occur in 1548, 1718, 1738 in TYMMS, *The East Anglian*, 8vo., 1866, ii, 228, 365; iv, 40. The injunctions at Hereford 1556, were item, that the master of the works therefore the time being shall cause the quire there to be made cleane on this side and before the feast of S. Michale the archangel next ensuing so forth once every year under the pain of xxs. for every fault therein to be converted to the use of the vicars of the quires; Brit. Mus., Harl. MS. No. 396. Sheffield church in 1566 to be "whytlymed"; 1570 the walls of the churches to be new-whited; by the 18th canon of the archbishops held in convocation. Eight entries from 1590 to 1719, at Randworth church, Norfolk. 1640 "whitelyminge of the yle that was built, ijs. 4d."; NOTES AND QUERIES *Journal*, 3 Ser., iii, 424. 1666 when the judges (in January) were about to return to Westminster after the plague, the justices were ordered to see that all bedding and other goods in the infected houses were well aired, the rooms all new whited, and the churchyards covered with earth two feet thick: Oxford Gazette, No. 16; quoted by COOPER, in *ARCHÆOLOGIA*, 1857, xxxvii, 19. In many villages in Cambridgeshire, houses are whitewashed or distempered, inside and out, annually just before the village feast.

Some examples done on the Continent may be cited:—Three half-length figures in the church of the abbey of Florence, by Giotto, were afterwards whitewashed over, to give more light to the church; VASARI, *Lives*, transl. by Foster, 8vo., 1850, i, 115. 1451 HANS of Mingolzheim agreed for certain work, as also to paint the choir white at Wimpfen. At Moscow, the buildings of the Kremlin would look better "if they were not miserably whitened; the most ancient churches as at Novgorod, Kiev, and Moscow, are whitened"; ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 4to., 1842, p. 91, 97. The emperor Leo, 725 caused the images in churches to be whitewashed over, waging against them a relentless war.

WHITING. Pure chalk well ground in water and run through a sieve with very fine meshes. BLANC D'ESPAGNE; SPANISH WHITE; and TROYES WHITE. PAINT. PUTTY. WHITE PAINT.

WHITLAND ABBEY SLATE. These quarries opened before 1874, produce slates of all sizes, sound, and of a green tint; the colour is not affected by London smoke or weather; quarries in Narberth road; or 1868 Llandisillio, Narbeth.

WHITT (GILES or Jellies de), a local mason, at Cobham, who 1601 undertook for £50 to carve two chimneypieces for the two chambers next the new chapel, for sir Henry Brooke, lord Cobham; *Calendars* (Domestic Series), 8vo., 1870, p. 46; and BUILDER *Journal*, 1886, ii, 187-S. The *Calendars*, p. 139, recite letters from R. Williams suggesting buildings to be done, and that Whitt should be set to work either on some new chimneypiece, or his lordship's father's tomb, that he may maintain himself.

WHITWELL (THOMAS STEDMAN), nephew of . . . Whitwell of Daventry, became a pupil of sir John Soane. In 1811 he was engaged in the architect's office at the London docks; and in 1820-1 designed the new library, Temple row west, Birmingham (Italian); and 1820 his design for the public library at Coventry was approved, about which time he exhibited various drawings of that town; 1821-2 designed Brompton park, Huntingdonshire, for lady O. B. Sparrow (Gothic); 1827 designed the Brunswick theatre, Goodman's fields, opened February 25th, 1828, used for two nights and the roof fell in on 28th; COMPANION TO ALMANACK, 1828, p. 174; much praised in *ATHENÆUM Journal* for 22 Feb., p. 140; CUMBERLAND, *Minor Theatre*, preface to "An uncle too many", No. 95, x or xi; G. SMITH, *Account of fall*; C. KNIGHT, *Passages of a Working Life*, 8vo., 1865, ii. He wrote *On warming and ventilating houses and buildings by means of large volumes of tempered air, as applied to some of the large edifices of Cambridge*, 4to., Camb., 1834, and *Warming, etc., of the Fever Wards, etc., of Addenbroke's Hospital, at Cambridge*, 4to., Camb., 1834. He is also said to have been the author of the lines "Ode to Dulwich College", a satire on the style of sir John Soane, who brought an action 12 June 1827; C. KNIGHT, *Boeotian Architecture*, in *European Magazine* for 1824; as in *BUILDER Journal*, 1858, xvi, 542; and 1864, xxii, 238. Soane v. Knight, Moody and Malkin, Nisi Prius, No. 74. It is not known who wrote the lines entitled "The Modern Goth", to the same point. Whitwell died before June 1840 in Gray's inn.

WHOLVE. A brick or stone culvert or tunnel. "Wholves, drains," etc.; local terms at Epping in Essex.

WHONE. "To repair, whone, and pullish and to make perfect to the gulding", occurs 1448-9, 27 Henry VI, in the agreements for the tombs in the Beauchamp chapel, Warwick. It probably means to clean. BRITTON, *Arch. Antiq.*, 4to., 1814, iv, 14. 19.

WHOP. A measure of lime, less than a bushel, 1548 (p. 35). A whop of iron to the barrelle of the chymes (p. 36); and a whope of charcoles (p. 68); "vi hoppes of charkcole for the plimar vjd." (note, about 4 pecks); CAMDEN SOCIETY, *Ludlow Accounts*, 4to., 1869.

WHYTE (baillie . . .) "planned and conducted" the high church at Paisley, 82 ft. by 62 ft. without pillars, it holds 3,000 persons; PENNANT, *Tour in Scotland*, 8vo., 1790, ii, 167.

WIBORG, Viborg, or Wyburg. The capital of Jutland, and one of the oldest towns in Denmark, situated on a lake of the same name. The place where the very early assemblies were held, kings elected, and money struck. The large domkirke dedicated to . . . was founded early xi cent., rebuilt 1130-70 (good Norman); 1569 repaired by Claus Andersen; and after several fires; and very carefully restored up to 1873 except the interior decorations at a cost of £35,000. It is 226 ft. by 98 ft., cruciform with a fine apse, and has an untouched crypt with eighteen granite pillars under the raised chancel. The Sönder-sogns kirke, formerly Dominican, dates from 1230, rebuilt 1728 after a fire; the fine altar xv cent., came from Frederiksborg; ten other churches no longer remain. A church school, arsenal, well-endowed hospital, and a building in which the provincial states meet, are noticeable. WEINWICH, *Maler, etc.*, 8vo., Cop., 1811. 14. 28. 50. 96.

Wyburg red wood deals, 3 ins. by 7 ins.; and 9 ins.; with 2½ in. by 7 in. battens, were 1855 delivered at Hull (perhaps from Wiborg in the gulf of Finland).

WICK. A village on the side of a river, as Hampton wick, on the river Thames.

WICKER-WORK, or basket-work. At an early date was often employed in forming vaulting. WATTLE.

WICKET (Fr. *guichet*). A small gate, or door within another door. An opening in part of a large door or gate, as of a fortress, or carriage gate, for the more ready passage of pedestrians, one at a time. SHAW, *Elizabethan Arch.*, 4to., 1834, pl. xlv, gives two examples from Little Chart church in Kent,

and Hatfield house, Hertfordshire. "1526, une grosse clef à la serrure du wicquet d'un tappeul xiid."; FONS-MÉLICOCC, *Les Artistes, etc., du Nord de la France*, 8vo., Bèthune, 1848, p. 133. In Scotland it is the name applied to the back door of a house.

5. 25.

WICKHAM (WILLIAM DE). See WYKEHAM (W. DE).

WIDTH or breadth. The opposite dimension to LENGTH.

WIDTH and with. See WITHE.

WIEBEKING (CARL FRIEDRICH, ritter von), was born 1762 at Wollin in Pomerania; became a topographer; after 1788 practised as engineer; 1802 in Austria, 1805 in Bavaria, and erected many bridges, most if not all of which are said to have failed. One near Munich crosses the river Isar, of three arches each 96 ft. span, was carried out about 1814 by his son Carl. They are described in ALLGEMEINE BAUZEITUNG, 1840, p. 341-7. He published from 1792 about seventeen different works; the principal ones are *Traité de la const. des Ponts à arches de Charpente*, 4to., pl. fol., Munich, 1810. *Theoretische-praktische Bürgerliche-baukunde* (tables of buildings and architects, 4 vols., 4to., Munich, 1811-17; pl. 1821-6. *Architectur Civile—édifices anciennes et modernes*, 7 vols., 4to., 260 pl. fol., Munich, 1823. *Architectur Hydraulique*, 4 vols., 4to., 153 pl. fol., Munich, 1814-24. *Analyse Descriptive des Monuments de l'Antiquité—de Moyen Age, etc.*, 3 vols., 4to., 167 pl. fol., Munich, 1838-40. He retired 1813 on a pension and died May 29, 1842, aged 80.

14. 68

WIEDEWELT (HANS), born 1646 at Meissen, went 1670 to Copenhagen, where he built the Reformed church, the Thott palace, and was employed on the schloss Friedrichsberg.

68.

WIEGAND in 1437 was employed on the tower of the cathedral of FRANKFURT on Main.

68.

WIELAND. In 1333 he contracted to build the church of SS. Peter and Paul, at Liegnitz; the tower was only completed as far as the roof; it was finished by Conrad, *maurer*. The contract is in the town archives.

68.

WIEN (Anc. *Vindobona*; Engl. Vienna, Fr. Vienne). The metropolis of the Austrian dominions and seat of the government. Prior to 1863 it was divided into the inner city and thirty-four suburbs; it now consists of nine sections, with eighteen suburbs beyond the lines, in immediate connection. Beyond the old districts is now a belt of boulevards called *ringe* averaging 165 ft. wide, opened 1 May 1865, formed on the site of the glacis of the fortifications down to 1858 when the city ceased to be a fortress; each *ringstrasse* is lined with new large private and public buildings and grounds; FÖRSTER, *Plan der innern Stadt Wien*, A. B., 1809, pl. 229. (The references marked A. B. herein describe the ALLGEMEINE BAUZEITUNG; and B. J. the BUILDER JOURNAL.) Vienna is situated on the river Wien, which unites with the Danau canal. Over these two are about thirty-one bridges within the lines and about 100 altogether. A new channel, part of the great works for the regulation of the Danube, formed 1870-74 being a new bed 1,000 ft. wide formed nine miles to and past the city; A. B., 1850, pl. 316-9, and 1876, pl. 74-83. Over the small river Wien are the bridges kronprinz Rudolf 1872-6 by H. K. von Fischer, cost nearly £150,000; Schinaker, 1830 by J. Jäckl; Elisabeth, 1850-54-67 by L. Förster, three stone arches with eight marble statues by various sculptors, CIVIL ENGINEER, ETC., *Journal*, 1854, xvii, 321 and plate, which replaced the bridge of XIII cent.; Schwarzenberg, 1864 by Hornbostel, A. B., 1870, pl. 59-60; Tegethof iron, 1872 by A. Köstlin and A. Battig, A. B., 1877, pl. 13-30; Carolinen, 1877 iron by Clark; Stuben, 1400 has been widened: Radetsky, 1854-5 by Mack of Hamburg; Neville, 1852 iron by Clark; Pilgram, 1866: with several minor ones. Over the larger Danau canal are eight bridges: Brigitta, 1871 iron by A. Köstlin and A. Battig; Augarten, 1873 iron by Mareaux carried out by Paul, A. B., 1881, pl. 50-3; Carl, 1819 by A. Behsel, A. B., 1836, was 1870 removed: Ferdinands, 1819 iron by Kudriaffsky or A. Nikolaus, was rebuilt 1863 and is partly of timber: Aspern, 1864 suspension by G. Rebham, allegorical statues by Melnitzky:

Franzens, 1803 by N. von Pakassy; rebuilt 1848 suspension by Ch. Nikolaus: Sophien, 1820-5 suspension by Kudriaffsky; rebuilt 1872 by A. Köstlin and A. Battig, A. B., 1876, pl. 82-3; Josefs, 1872 iron by Mareaux: and Stephanie, iron by O. Heiser and G. Zampis, A. B., 1887, pl. 68-71, 197 Engl. ft. span. Also one in vorstadt Weissgärber, by Maack, A. B., 1850, pl. 308: and Karntnerthor, by L. Förster, A. B., 1854, pl. 608-9.

The public promenades are, the Augarten, opened 1775 (its *palace s. v.*); the Prater 1570, laid out 1766; the stadtpark laid out 1862, in it is the kursalon (ren.) 1865-7 by J. Garben, cost about £31,000; and 1867 by G. Haussmann, A. B., 1872, pl. 45-59; Volksgarten, laid out 1824, with a café, after the temple to Theseus at Athens 1805-19 by P. von Nobile, in it is the Theseus killing the Minotaur by Canova; its long arcade by K. von Hasenauer, B. J., 1876, xxxiv, 974; the Graben (ditch) 540 ft. long and 100 ft. wide; the hofgarten 450 ft. by 300 ft.; the Ringstrasse 13,000 ft. long and 180 ft. wide; the new parade in front of the palace about 1,000 ft. long by 650 ft.; the Liechtenstein gardens; and the Schwarzenberg gardens 1761; the Kolowrat ring, a fine boulevard, B. J., 1877, xxxv, 582; and the Franzensring, B. J., 1882, xlii, 363. There are about twenty statues and columns, and ten or more public fountains.

Railway stations. Ferdinands Nordbahn; terminus 1859 by Ehrenhaus, area 100,000 ft., completed 1866 by T. Hoffmann; A. B., 1870, pl. 20-8. Südbahn Gesellschaft with the Gloggnitz; A. B., 1842, pl. 464-7; 1858, pl. 167-9; 1868-70 by W. Flattiche, 1870, pl. 17-9; and 1874, pl. 21-6: a bridge, system Schnirch, 69 metres or 226.38 Engl. ft. span; 1886, pl. 66-70. Elisabeth west-bahn; 1854 by Bayers and others. Franz Josefsbahn, north; 1864-72 by ... Ullmann and Barvisius. Nordwestbahn; 1868-73 by W. Bätmer; A. B., 1873, pl. 1; Staatsbahn, *Zeitsch. des Oesterr. Ing.- und Arch.-Ver.*, 1871. (Central station of a circular elevated railway near the exchange, was proposed by Joseph Fogerty, C.E. and F.R.I.B.A.; B. J., 1882, xlii, 100; the Fogerty syndicate 60,000,000 fl., B. J., 1883, xlii, 161, 686, 756, 796.) The water works inaugurated 1870, B. J., xxviii, 391; the additions, *idem*, 1873, xxxvi, 1302. The old supply with the four new reservoirs; also the abzugskanäle or sewers, A. B., 1844, pl. 594-5, 686; are described in WINKLER. FÖLSCH UND HORNBOSTEL, *Wiens Wasserversorgung*, 1862-3-4. WERTHEIM, *Wasserversorgung Wiens*, 1872.

The development of modern housebuilding has, it would seem, been much facilitated by the constructive skill of several local architects; during the last twenty years large houses have been built, the grouping of which has been designed to produce striking architectural effects; as a rule the owners occupy the extensive apartments on the first floor, while the upper stories are divided into smaller dwellings and let. These modern edifices for residences and warehouses, are represented in almost every volume of the A. B.; an index to which under subjects for vols. 1-50, 1836-85, was issued 4to., Jan. 1887. The list of these illustrations is too long for insertion (a few are given in WINKLER, p. 120) but those of the churches and other public buildings are incorporated in this text. The B. J., 1863, xxi, 724, gives the residence of Albert von Klein, in Jägerzeile, by the late L. Foerster; and 1880, xxxix, 231, the porcelain shop by baurath G. Korompay. Many large single buildings are let out in flats: the largest *höfe* or blocks, are Schottenhof which once belonged to the Scotch Benedictines, invited over in 1158, but superseded by German monks; opposite is the almost as spacious Melkerhof, belonging to the abbey of Melk or Mölk; Trattnerhof, 1773-6 by P. Mollner, has 400 residents; the Bürgerspital has 11 courts, 212 dwellings and 1,400 residents; the Starhenbergische freihaus in Wieden, has 200 different dwellings (300 dwellings, 6 courts, 31 staircases and 2,000 persons); the Rothehaus in Alsergrund is scarcely less extensive.

The cathedral is dedicated to S. Stephen. The two small west towers, upper part octagonal (*heidenthürme*) and adjoining portion are the remains of the romanesque work 1137-41 or

1144-47 by meister Octavian Falkner or Volkner of Cracow; it was restored 1258 and 1275 and raised, otherwise this edifice dates 1300-1510. 1326 the crypt of three stories or divisions was widened by Ulrich von Tirna, part of which from XIV to XVII cent. was the burial-place of the imperial family and then closed. 1359-1404, the choir enlarged, the steep roof, 1394 the kreuzkapelle and Eligius kapelle were built, also the transepts, the south tower for two-thirds of its height; and 1396 the S. Catharine kapelle on its east side with a large font (? 1481 by Heinrich) bearing the twelve Apostles in relief, by Wenzla von Kloster Neuberg (not Georg Hauser) till 1404. P. von Brachowitz succeeded at it until 1429; and then H. Buchsbaum von Brachadiez, who with his assistants 1433 completed the spire (not A. Pilgram). The tower 1450 was injured by lightning and threatened to fall, and the spire in 1519 by the earthquake. L. and G. Hauser 1516-20 conjointly undertook the task declined by other architects of taking down and restoring the spire which had an iron spindle bent by the lightning; 1839-42 it was restored by Sprenger for a height of 182 ft., partly by an iron framework (CIVIL ENGINEER, etc., *Journal*, 1844, vii, 34); 1854-60-64 nearly rebuilt for 168 ft. by Ernst (d. 1862) and F. Schmidt at a cost of 50,000 fl. The correct height is put at 420 ft. by HORMAYR, 430, 450, 445, 453, and 480 ft. are stated: in A. B., 1843, pl. 492-3, it is marked 435 ft. 6½ zoll.

The decorations and statues and rich portals of the two lower aisles executed by H. Kumpf and C. Horn. The gable on the west side completed 1430 by H. Buchsbaum (died 1454), who also worked on the upper part of the choir, and 1433 or 1450 began the north transept tower with Eagle gate; (on east side is the Barbara kapelle, restored 1854, the votiv altar 1853 by ... Stache and H. von Ferstel, A. B., 1855, pl. 717). 1455-68 (?) L. Steinhauser continued this north tower; 1460-75 by L. Pfennig of Dresden, who carried out the two side choirs; 1475-85 S. Koenig of Constance; about 1481 S. Achleiner; about 1482 T. Roriczer of Ratibon was consulted; about 1485-95 by G. Khlaidg of Erfurt; 1516-20 by G. and L. Hauser, who raised it 25 fathoms to its present height of 212 ft. and the slowly conducted work came to an end. Other meisters were 1524 M. Froeschel; 1547 B. Wolmuert of Frankfurt sur Main; H. Saphoy who 1579 added the small *aufsätze* to this tower; 1643 H. Herstorfer; A. Häresleb died Sept. 1683; ... 1810-13 J. Aman restored the church; ... 1831 the steep roof was covered with coloured tiles forming a colossal mosaic of the Austrian eagle; 1839-42 P. Sprenger was engaged; 1853 south gable restored; 1856 north gable, and continued repairs perhaps under Ernst who died 1862; and succeeded 1891 by F. Schmidt as dombaumeister. External pulpit on angle of north chancel aisle before 1451. The richly carved wood XV cent. stalls (ENDLICHER, *The Stalls*, carved by Jörg Syrnsten, 15 pl., fol., 1851). Between the north aisle and transept was a former organ-loft, where is the stone figure of Jörg Oechsel, mason (XVI cent. ? B. J.), looking through a small window; there is also described two half-length statues dating 1313, one holding a pair of compasses, the other a square (? Buchsbaum), attributed to the master-builder and his apprentice; and to A. Pilgram; also that under the small organ-loft by the north transept is a portrait, and another under the interior pulpit; DIBDIN, *Bibl. Tour*, 8vo., 1829, iii, 553-4; ENCYC. METROP., 4to., 1845, xxii, 16; BUILDER *Journal*, 1858, xvi, 727; C. von Dunkelspiel and H. von Hessen with perhaps a Pilgram worked on the loft, perhaps finished before the pulpit by him. In 1511-2 A. Pilgram of Bruenn is said to have carved the stone pulpit, or it was done by A. Grabner, C. von Humberg, J. Peham and H. von Vartzheim, under Buchsbaum (died 1454) according to TSCHISCHKA. In south aisle the red marble sarcophagus of emperor Frederick III (1403) having 240 figures and 32 coats of arms by N. Lerch of Strassburg (1467-1513), said to have cost 40,000 ducats; the mausoleum of prince Eugene of Savoy (died 1736) was completed 1759.

This church stands tenth in the list of German large churches, the area being exceeded by Lübeck. The nave is 345 Engl. ft. by 230 ft.; or internally 342 ft. by 222 ft. and 79 ft. high; the nave 33 ft. 6 ins. wide, the pillars 8 ft. thick; lateral nave 28 ft. wide; and middle vaulting 86 ft. high: also called 118 yards long, nave 11½ wide and 89 ft. wide, the aisles 9 yards wide (BAEDEKER).

OGESSER, *Met. Kirche zu S. Steph.*, 8vo., Wien, 1779. TILMEZ, *Der Stephansthurm*, 1721. TSCHISCHKA, *Der S. St. Dom*, 44, pl., fol., Vienna, 1832; 1843. HEIDELOFF, *Die Bauhütten*, 4to., Nur., 1844, p. 30. GAILHABAUD, *Monumens*, 4to., Paris, 1842-52, iii, gives the pulpit. RUPP, *Chiese principali d'Europa*, 10 pl., fol., Milan, 1824-31. SCHMIDT, *Ueber den Ausbau der St.*, 1871. *Cath. de S. Etienne*, 10 large pl. int. and ext., fol. BULTEMEYER, *Ein schöner Kupferstich*, 1872. PERGER, *Der Dom zu S. Steph.*, by Fiel, 8vo., Trieste, 1854. MELLY, *West-portal des Domes zu Wien. Faccinelle of the South Tower*; A. B., 1844, pl. 628. *Umbau der obern Pyramide*, by Sprenger, A. B., 1843, pl. 492-3. *Ausbau der Giebel*, south side, A. B., 1853, pl. 537-8: in B. J., 1863, xxi, 772; and BERNARD SMITH, *Sketches Abroad*, fol., 1880, pl. 17. The cathedral described, with exterior view, in B. J., 1873, xxxi, 864.

The archiepiscopal palace with chapel of S. Andrew 1632-41. The churgebaude in the archives of the baumeisters; two large inscription tables of all the names of the baumeisters and steinmetz from ancient times with their monograms, were renewed 1627 by S. Unger; also the drawing on parchment of the south tower 15 ft. long. The Funfkirchen palace in the Wollzeile, before 1885 by A. von Schwendenwein.

Alt Lerchenfelder parish; red brick, Ital. med. finished in rom.; 1847-53 by J. G. Müller, A. B., 1880, pl. 29 (d. 1861), and finished by Sitte and Fiedler; interior by E. van der Nüll, Fuhrich, and others. Barmherzigen brüder; rebuilt 1692; 1748 dome of good construction. IX. Bezirks. . . . by H. Bergmann. Brigetta parish; 1867-73 by F. Schmidt; A. B., 1882, pl. 7-9. *Zeitschr. der österr. Ing.- und Arch. vereins*, 1869. Cajuchin; 1622-32, burial vault of imperial family from 1619. Carmelites parish; XVI cent. to the Jesuits; 1662 façade by C. Carnevale. INDIAN, *Wiener Arch. und Stulen.*, Augs., 1713. Dominican; burnt 1258, destroyed 1529, rebuilt 1631. Franciscans; see S. Hieronymus. Frauen vom orden heiligsten Erlösers; by K. Rösner; A. B., 1836, pl. 21-3. Fünfhauser parish; 1867-74 by F. Schmidt; A. B., 1875, pl. 61-4. Garrison protestant; 1633-8, 1861 of the Jesuits, rich but fanciful façade. German knights; see S. Elisabeth. Greek. S. Barbara of the united Greeks, or R. C. of the Greek rite. Pfarr und Schulzbaude der Griechen (Byz.). Disunited 1804; 1852-6 interior restored; façade 1856 by T. Hansen, paintings by Rahl; A. B., 1861, pl. 418-24. [and enlarged by Henrich. Heil. Kreutz; 1737. Another church restored 1736, tower added 1749. Heil. Schutzengela parish; 1627-9; restored 1817-20. Heilandskirche, the Saviour; see Votivkirche. [the choir. Heil. 14 nothhelfern; 1712; enlarged 1770 by J. Ritter, three domes over Holy Trinity; 1690-1702, large; now to Minorites. Hungarian; see S. John. Israelitischer tempel; see Synagoge. Italians; see Minoriten; and Maria Schnee. Johannes Tauffer; 1200, restored 1806. Johannes; 1842-5 by K. Rösner. Karl or S. Carl Borromäus; 1716-38 by J. B. Fischer von Erlach, carried out 1736-67 by P. Martinioli; a dome; façade flanked by two lofty columns as bellries each 145 ft. high, 18 ft. diam. with reliefs up them by Mader, of the life of that saint; A. B., 1880, pl. 4-6. *Besch. der pfarrk.*, Wien, 1837. Karlostege am Franz Josefs quai; Kapelle nachst dem; A. B., 1879, pl. 39. Lazaristen; 1860-62 by F. Schmidt. Leopold parish; 1670, enlarged 1723 by Johan Ospel. Maltese; see S. John. Maria Geburt parish; 1768 by L. Grossmann. Maria Heimsuchung; 1717, like S. Peter's, dome covered with copper. Maria Hilf parish; 1713. Maria Schnee of the Italians; completed 1805-30 by C. or H. Scheinpfeil or Schimpfenpfeil, perhaps three west fine portals; interior restored 1765-90 by G. da Milano. Maria Stiegen; 882; west front from XIII cent.; the towers and remainder rebuilt (Gothic) 1395-1412; repaired 1820; now by the Slavonians; has a narrow and lofty nave without aisles, joins the wider choir in an oblique direction; some good stained glass; heptagonal tower 190 ft. high. *Mitt. der k. k. Central com. zur Erhaltung der Baudenk.*, 1856

and 1857. SPRINGER UND WALDHEIM, *Oesterr. Kirch. Konstdenk. der Vorzeit*, Wien, 1857. BERNARD SMITH, *Sketches Abroad*, fol., 1880, pl. 22, gives the tower. LICHNOWSKY, *Denkmale der Baukunst—des Mittel, in dem Oester. Kaiserthum*.

Maria Treu; 1698-1716, large dome; 1860 two towers by Sitte.

Maria Trost parish (or S. Ulrich); 1694, restored 1721 by Reymund, 1836 restored. On spot where the grand vizier's tent was pitched 1683 during the siege. [Carnevale or Carlon.

Maria Verkündigung Servites parish; 1651-1678, finished 1717 by C. Mechitaristen for the Capuchins; 1603, restored 1683; 1810 to the order. Minoriten of the Italians; founded 1395; 1289 by C. or H. Scheinpfell or Schimpfenfell; 1385, by Nicolaus; in it is a copy in mosaic of the Last Supper by Raffaeli 1806-14, cost £20,000. *Berichte des W. Alter.*, band iii.

Minoriten; see Holy Trinity.

Protestant in Gumpendorferstrasse; Bethaus der Evang. Gemeinde; Romanesque, 1846-9 by L. von Förster and T. von Hansen; A. B., 1849, pl. 228-34.

Two in Dorotheenstrasse; 1581, 1783 altered; the other 1784 by ... Nigelli; good pulpit.

Redemptorists; 1844-6 by K. Rösner. [Schmidt.

Rudolphsheim, outside Maria hill line; Gothic with dome, by F. von Salesianerinnen; finished 1728, with convent for noble maidens.

Schotten; 1158 by M. Hunger; 1418; rebuilt 1690; restored 1816-22; tomb of count Starhenberg, d. 1701; high altar by H. von Ferstel; A. B., 1885, pl. 1. Convent 1827-32 by J. Kornhäusel.

Servites; see Maria Verkündigung.

Sisters of Mercy; church and convent, Lombardic, 1834.

Slavonians; see Maria Stiegen.

Sonnenhof of S. Joseph; 1768 by ... Duschinger.

Sta. Anna; 1415, burnt 1747, formerly of the Jesuits, and rebuilt now of the French.

S. Augustina parish; Gothic, 1330-39 by D. Landtner; modernized 1786; tower rebuilt 1849-50. Monument of Archduchess Maria Christina, d. 1798, by Canova, erected 1805, cost 200,000 ducats. The todten S. Georg kapelle 1337-41; and the Loreto kapelle, 1784, containing the urns in which are kept the hearts of the deceased imperial family. Convent 1327; the choir end of XIV cent. *Berichte des Wiener Alterthumsvereins*, band iii. [Greeks.

S. Barbara; 1654 by the Jesuits; after 1775; and 1852 remodelled for the S. Carlo Borromeo; 1736-67; see Karls.

S. Elisabeth or German order; 1316-26 by J. Schiffering of Noerdlingen; restored 1395; 1747-8 modernized and new tower; 1864 again by Lippert.

S. Elisabeth; 1709-10-11-15 for hospital of poor women modernized by M. Gerl.

S. Elisabeth at Wieden; Gothic, brick; 1860-6 by H. Bergmann.

S. Egidius parish; 1765-70. S. Florian parish; 1725.

S. Hieronymus for the Franciscans; 1451; 1603-14 rebuilt by P. Daum, except end of choir.

S. John Baptist or Maltose; for Hungarians.

S. Joseph, or Sonnenhof; 1768 by ... Duschinger.

S. Joseph parish; 1692 for the Carmelites, enlarged 1727, parish 1783, restored 1857.

S. Laurenz parish; Italian 1784-7.

S. Margaret parish; 1690.

S. Margaret, Weissgärber parish, 1866-79 by F. Schmidt, cost 450,000 fl. or £45,000; good tower 240 ft. high completed.

S. Michael parish; 1219-21 old German; crypt remains; burnt 1340 and 1416; magnificent; tower 1608 repaired by B. Parchauser, steinmetz; 1716 portal by Mathielly; *Berichte des W. Alterthums*, band iii.

S. Othmar, parish, unter den Wiessgarten; by F. von Schmidt; A. B., 1881, pl. 54-8.

S. Peter at the graben; 1107, rebuilt 1702-33 with a dome, by J. B. or E. Fischer; portal 1756; 1839-44 restored.

S. Peter and Paul parish; enlarged 1771.

S. Rochus and S. Sebastian parish; large, 1636, repaired after 1683.

S. Ruprecht; from 740 or XI cent., oldest Christian church in the city; 1436 rebuilt and often restored.

S. Thekla; 1754-6.

S. Ulrich; see Maria Trost.

S. Ursula; 1664-75.

Votivkirche, the heilandskirche, or The Saviour; Gothic, 1854 general competition; 1857—consecrated 24 April 1879, by H. von Ferstel; 295 ft. long by 92 ft. high, or 273 ft. by 99 ft. wide with chapels; nave 36 ft. by 95 ft. high; two open-work spires 345 ft., or 309 ft. high, at west end; the transepts 156 ft. long have an octagon at the crossing; the area 20,000 square ft. is covered with eucastic tiles; good painted glass and metal work; total cost over £400,000; Jos. Krauner was the clever executive architect, but died towards the completion; A. B., 1858, pl. 164-6; 1886, pl. 1-6; *projets* by F. Schmidt, 1857, pl. 78-80, and by V. Statz, pl. 89-91; *BUILDER Journal*, 1876, xxxiv, 662; 1879, xxxvii, 719. THAUSING, *Votivkirche*, fol., 1879.

ARCH. PUB. SOC.

Weissgärber parish; see S. Margaret.

Synagogue in Kienmarkt; 1826 by J. Kornhäusel. In Leopoldstadt, 1853-58, by L. von Förster; highly decorated interior; A. B., 1859, pl. 230-5. Another one 1885 in vi Bezirk after the ancient one at Prag, by Max Fleischer.

Of the cemeteries, the central friedhof at Kaiser Ebersdorf 1870 is the only one now used. The Evangelischen friedhof has a chapel 1858, Byzantine, by T. von Hansen, A. B., 1863, pl. 575-9.

CONVINUS, *Recueil des Eglises de Vienne. Erinnerungen an Wien*, 43 pl. of churches, 4to. KLEINER AND PFETZEL, *Abbildung aller Kirchen und Kloster*, fol., Wien, 1724.

Imperial palace. Kaiserlicher-burg or hofburg, is of various dates and irregular; has four courts; 1. Schweizerhof, the east or oldest part from 1208-30 by M. Buschperger, burnt 1275, rebuilt 1536-52. 2. Franzens or Burg-platz, portals restored 1854; the burgpfarrkapelle restored 1448, end of choir only remains; adorned 1748, interior 1800 by J. Aman; the private library and the treasury; on the south side is the Leopoldinische burg, burnt 1668, restored 1670, with S. Michael's chapel and the controlorgang, and apartments: fronting it is the Rittersaal 1805 by Montoyer; on the opposite or north side is the best portion, the reichskanzlei or staatskanzlei, 1728 by J. Fischer, with colossal groups by Mathielly, and was called one of the finest buildings in Germany. 3. Amelienhof, end of XVI cent., exterior plain. Adjoining west was the balhaus pulled down and the baukanzlei 1754 altered by Fischer, was built on its site. Adjoining and on south side of 4. the Josefsplatz is the hof bibliothek, 1722-6-35 by J. Fischer from the design of S. Kleiner, a gallery 240 or 250 ft. Aust. long by 54 ft. wide and 90 ft. wide in centre with a dome, comprising nearly 400,000 vols., 20,000 MSS. and 300,000 prints; the Schatzkammer or jewel office; cabinets of antiques, cameos, Greek vases, coins, etc.; the redoutensaal 1767; and 1790 zoological and botanical collections: the ball-rooms. Winter riding-school, 1729-35 by J. Fischer, with a stone gallery supported by 46 columns; and adjoining it the summer riding-school: a passage leads to the burg theatre, 1741, enlarged 1756, and 1817 restored by J. Aman. Säulengang in the gardens 1775 by J. F. Hetzen-dorf von Hohenberg; and conservatory by L. von Remy, 565 ft. long by 323 ft. Far to the south side of this hofburg are the imperial stables for over 416 horses, 1725 by J. B. and J. Fischer, 600 or 1,200 ft. long of two floors; 1825 side additions; the riding-school by Meyer.

The hof architekt Prosche died 1803; J. Aman died 1834; in 1847 W. Westmann was hofbaurath. The foundations of a new palace from designs by G. Semper and K. von Hasenauer to cost 2½ millions sterling. Triumphal arch in front of great entrance, *cir.* 1700 by J. L. Hildebrand; the burghor for Leopold I (1658-1705) was retained; the outer burghor or palace gate on site of bastions destroyed 1809, is a propyleum of the Doric order, having five equal archways, 1822-24 by P. von Nobile, 1864 restored by T. von Hansen; A. B., 1881, pl. 41-5.

About 100 palaces—Prince Liechtenstein palace, vordere Schenkenstrasse; 1694 by J. von Hildebrand; 220 ft. frontage; has a library, theatre, and stabling; almost rebuilt 1839-47 from designs by Desvignes of England at a cost of £60,000 (28). In 1770 J. Ritter was the family baumeister; and plans of several of the Liechtenstein palaces were *cir.* 1700 prepared by G. di Gabrielli. One in the Herrngasse finished 1793. SMIRKE, *Spectimens of Cont. Arch.*, fol., 1806, pl. 7-8, gives plan, elev. and view of the first-named palace; portal in A. B., 1879, pl. 68. The garden palace 1701-12 by D. Martinelli, built by A. Christian of Innsbruck.

The summer palace, is of the same date and designers, A. B., 1882, p. 74-6; a fine staircase; a gallery of 1,600 pictures; the Geological institution founded 1849 is within this palace. Formerly Rasamofsky. Prince Schwarzenburg, formerly count Mansfeld; 1704-6; 1716-26 by J. B. or J. Fischer.

Emperor Joseph II.; 1775 in the Augarten still in its original condition. Count Schönborn; by a Fischer; with gallery of pictures.

Prince Carl, former palace now the pavillon royal in the English garden; 1803 by H. K. von Fischer. See The Albertina Museum.

Prince Albrecht; 1801-4 by ... Montoyer; New palace adjoining 1863 by ... Heft and ... Oelzelt; stallhof by ... Heft, A. B., 1865, pl. 739.

1867 façade enriched; or palace, by R. Raschka; A. B., 1877, pl. 51-4; the terrace and fountains, A. B., 1868-9, pl. 55.

Prince Esterházy 1695; on site of hunting lodge of S. Leopold; and see Kannitz. Duke Augustus of Coburg.

Prince Metternich; before 1885 by A. von Schwendenwein.

Prince Graf Dietrichstein; 1885-90, later Lobkowitz.

Prince Montenuovo; 1851-2.

Palace Sina, part of the Berghof, the oldest house in Vienna, on site of the praetorium; before and after restoration by T. von Hansen, A. B., 1876, pl. 48-50.

Palace Reitzes, by W. Fraenkel; A. B., 1881, pl. 19-22.

Hen. L. Epstein, 1870 by T. von Hansen; A. B., 1871, pl. 71-6.

The duke of Modena, dining-room for archduchess Maria Beatrice d'Este.

by QUARENGHI, *Fabrique*, fol., 1821, pl. 19-20. [the hôtel impérial.

Duke Philip of Württemberg; 1863-5 by ... Zanetti and ... Gross; now

Archduke William (ren.); 1865-7 by T. von Hansen and ... Hluka.

Prince W. Kaunitz; *cir.* 1700 by J. L. Hildebrand; later Esterházy; now

the town community; in the centre building is the städtisches gymnasium.

Archduke Karl Ludwig Victor; 1865 by H. von Ferstel; *Zeitschr. des*

Osterr. Arch.- und Ing.- Ver., 1868.

Palaviciini, later count de Fries; 1775-84 by J. F. Hetzendorf von

Hohenberg, portal with two pairs of Caryatides by Zauner.

Harach; 1689, with fine chapel 1702 by J. Kernowsky; and gallery of

pictures. 1845 restored and a pavilion altered.

Count Rasumoffsky; later Liechtenstein.

Prince Eugene of Savoy; *cir.* 1700 by J. L. Hildebrand, or 1724 by J. B.

Fischer von Erlach; later the mint; Reichsfinanz min. since 1864.

Kinsky; 1710 by J. L. Hildebrand; formerly Daun, restored 1852-54.

Koburg; 1843-47 by Schleps.

J. Leop. von Trautson; now Ungarischen leibgarde; 1711 or 1720-30 by

J. B. Fischer; and 1866.

Auersperg; for marquis Roßnau; 1724-33 by J. B. Fischer.

Villa Metternich; 1840 by ... Romano. Count Prinzenstein; 1863-5.

Count Larisch; 1867 by E. van der Null and A. von Siccardsburg, finished

by ... Stadler. Czernin, with a gallery of pictures.

Count Hardyz; before 1885 by A. von Schwendenwein.

KLEINER AND PEFPEL, *Les quatre-plans et vices—hors de la résidence de*

Vienna, i. Favorite; ii. Schwarzenberg; iii. Liechtenstein; and iv,

comte d'Althaus, 33 pl., fol., Augs., 1724 *cir.*

Hotels, etc. Impérial, former palace of duke Philip of Württemberg, arranged by C. Tietz, A. B., 1871, pl. 24-34. Britannia; 1873 by Claus and Gross, A. B., 1873, pl. 31-3; Donau, 1873 by the same, pl. 41-4. Metropole am Franz Josefs; by L. Tischler or by C. Schumann, A. B., 1879, pl. 76-7. "Goldene Ente"; by L. Tischler, A. B., 1890, pl. 10-12. Grand; 1866 by C. Tietz. Austria; ... by ... Frankel. Union, by Procop. The Artists' club house; 18... by F. Stache. Das Künstlerhaus; 1865-8 by A. Weber, A. B., 1881, pl. 46-9. Adeliges casino, by Romano. Majoritätshaus der grafen von Hoyos. Sprinzenstein; 1863-5 by L. von Förster; A. B., text 1864. Athenäum, 1878. The Adeliges, or Nobles, casino; by H. von Ferstel. The Nobles' club on the Kolowrat ring; before 1885 by A. von Schwendenwein. Mosertrakt der stiftskaserne, or officers' pavilion, by E. Schweigl; A. B., 1877, pl. 60-4. Engineer and Architects; forming one building with Trade institution; 1870 by O. Thienemann.

Great exhibition buildings of 1873; the larger part of the galleries were removed, but the Rotunda of cast iron by Scott Russell, C.E., 354 ft. diam., machine, art, imperial pavilion, jury pavilion, and palace of viceroy of Egypt, all remain. The treble gallery is used as warehouses for the wharves on the Donau. *The Times newspaper*, for Dec. 9, 1872. B. J., 1873, xxxi, 39, etc.

Official buildings. Justiz palast; (Germ. ren.) 1875-81 by A. Wilemans Edler von Monteforte, cost £225,000; B. J., 1878, xxxvi, 962-4; 1879, xxxvii, 202; WIELEMANS UND AUER, *Justiz palast*, fol., Wien, 1885; *Wiener mont. baut.*, 20 pts., 1880. Reichsraths-gebäude or Parliament houses; (Greek) proposed 1873; first stone 18 January 1883, by T. von Hansen; peristyle of 24 marble columns; B. J., 1877, xxxv, 1294; 1883, xlv, 92. Ständenhaus or house of assembly for Lower Austria; 1513-30-71; rebuilt 4 stories 1838 by Pichl; and Stadthalerei, 1845-7 by Sprenger. Kärnthnerhof; by O. Thienemann; A. B., 1877, pl. 47-50. Hofkriegsraths gebäude or war office; 1775. Military buildings 1863. Gen. Kommando gebäude, finished

1874 W. von Doderer; A. B., 1880, pl. 31-7. Ackerbau ministeriums; by E. ritter Trojans von Bylanow; A. B., 1886, pl. 22-5. Magistrats gebäude; xvi and xvii cent., and 1780; 1822 enlarged by Behsel. Ministeriums des Auswärtigen; Foreign affairs, 1767. Staats ministerium; 1716 by J. B. Fischer von Erlach, 1753-4 enlarged, four colossal termini to the basement; 1821 altered; 1757 was the hofkanzlei of the Bohemian, Austrian, and Moravian states; (the Hungarian dates 1767, and the Transylvanian 1784). Reichsfinanz min.; 1703 by same for prinz Eugene, formerly the mint, converted since 1864. Finanzbehörden; 1841-7 by P. Sprenger.

Civic buildings. The old Rathhaus dates from about 1316; with the hall; adjoining are two chapels of S. Salvator xv cent. united by an archway, one dating from 1360, the other xvi cent. with a fine ren. portal and a modern tower; restored 1455, and enlarged: the façade dates from 1598-1620 restored 1706; upper stories 1851-3 added. The fountain with group in lead of Andromeda and Perseus by R. Donner (died 1741); B. J., 1879, xxxvii, 828; *Berichte des W. alterthum.*, band ii. Weiss, *Gesch. und Besch. der Rathhaus capelle*. Neues rathhaus (Gothic), 1873-83 Sept., by F. von Schmidt; tower 330 ft. high surmounted by a figure 9 ft. high holding a flagstaff 16 ft. and a sword 6 ft. 6 ins. long; four smaller towers; a large court and eight smaller ones; 500 rooms including two large festival halls. Cost 12,000,000 florins or £1,000,000 sterling; a collection of arms and armour 1584-1672, and municipal library; COMPANION to ALMANACK, 1885, p. 161; B. J., 1877, xxxv, 978; decorations, 1881, xl, 111; 1881, xli, 512-6; 1882, xliii, 553, 763; xlv, 756; xlv, 403, plan 667; FARROW, at R.I.B.A. Zollgebäude or custom-house; 1838 or later; 360 ft. long, wings 300 ft. each. Sternwarte or observatory; 1874-83 by F. Fellner and H. Helmer; A. B., 1881, pl. 1-6; B. J., 1881, xl, 283; 1883, xlv, 196. Hof und staats druckerei or imperial printing office. Münz-amtsgebäude or mint; 1836 by P. Sprenger. The nine Bezirk have each a police establishment. The criminal gerichtshaus was restored 1836.

Military buildings. Zeughaus or imperial arsenal; 1849-55, brick; front 690 ft. long by 2,100 ft. depth and commander's residence, by E. van der Nüll and A. von Siccardsburg; comprises church of Maria vom Seige by K. Rösner; gewerbfabrik, etc., by L. von Förster and T. Hansen; hospital; technical establishments by Hansen; extensive werkstätten gebäude; waffen museum or armoury, by Förster continued by T. Hansen, B. J., 1866, xxiv, 706, 742, cost £130,000, comprises a vestibule with fifty-two marble statues of generals, staircase painted by Rahl, the ruhmeshalle or hall of fame, seagliola lined walls, dome 72 ft. high, B. J., 1882, xlii, 450; staircase to the gallery, A. B., 1850, pl. 307; 1864, pl. 622-36; 1865, pl. 706-27; 1886, pl. 19-22. Bürgerliche zeughaus; 1732 by L. Mathiely; A. B., 1879, pl. 62; the waffen saal is on the first floor; armour dates from 1848. There are twenty-two barracks, among which the Rudolf, Franz Josefs, and Infantry barracks 1751, are noticed. Administrations gebäude for the army.

Banking purposes. Old exchange; 1822 by C. von Moreau, or 1856-60 (ren.) disused since 1872, which gave place to the Geld un Fonds börse; a design 1869 made by G. Semper; finished 1876 by T. von Hansen and C. Tietz; 300 ft. by 324 ft.; B. J., 1877, xxxv, 1102; 1878, xxxvi, 1224; A. B., 1879, pl. 1-17. Geschäftshaus der n. ö. escompte-gesellschaft (insurance); by Gross und Jelinek, A. B., 1885, pl. 32-5. Das Gebäude der k. k. priv. Allg. Ost. Bodenkredit Anstalt; by E. von Förster, A. B., 1889, pl. 1-9. Des gebäudes der Ost. Nat. bank; neuen zubau portal, by F. Schmidt, A. B., 1880, pl. 30. Austrian national bank; 1820 (Greek) by C. von Moreau; the ausschussversammlungs saal, 50 ft. Pruss. by 27 ft., by 19 ft. high, carried out by R. von Rigel. Savings-bank; after 1836, by Pichl, is of five floors. New National bank; 1856-60; by H. von Ferstel, has a börsesaal on first floor, 394 sq. m., or 4,242 sq. Engl. ft. Bank and börsengebäude; by H. von Ferstel; A. B., 1860, pl. 308-16; B. J., 1860, xviii, 464; 1863, xxi, 737-41; 1864, xxii, 224-5.

Geschäftshaus der k. k. priv. Allgemeinen Verkehrsbank; by F. Schachner, A. B., 1886, pl. 72-5. Creditanstalt; 1858-60 by Frölich.

Educational buildings. Universität, founded 1237 and 1365; 1752-6 reorganised; the new building (early Florentine, upper parts stucco), 1874(?) - 80 by H. von Ferstel for 6,000 students, 350 professors; A. B., 1880, pl. 50-1; its chemisches laboratorium, 1874 (?) by von Ferstel; A. B., 1874, pl. 51-60. Sternwarte by F. Fellner and H. Helmer. Imperial gymnasium or public secondary school; opened 1866, the examination hall has a good hammer-beam roof. Polytechnische institut, founded 1815; 1816-8 by J. Schemel ritter von Leytenbach and Teytenbach; 1836-9 enlarged by prof. Stummer, A. B., 1839, pl. 303-5; the roof of laminated ribs in CIVIL ENGINEER, etc., *Journal*, 1841, iv, 414; 1866 largely increased by prof. Wappler; observatory by prof. Herr Wist, *Studien (Observ.)*; the technological museum adjoins it; a bronze statue 1863 of Ressel, the inventor of the screw propeller. Academiesch gymnasium; 1863-66 by F. von Schmidt. Das ober-gymnasium in Ober-Döbling; by K. Hintrager, A. B., 1888, pl. 75-8. Evangelische schulgebäude; (ren.), 1861 by T. von Hansen; A. B., 1867, pl. 62-6. Städtische Bürgerschul für Knaben und Mädchen; 1867-8 by G. Haussmann; A. B., text 1868-9. Czechische schule im x. Bezirke; by H. Krackowizer, A. B., 1884, pl. 64. Schulhaus der Gemeinde Liesing; by A. Krumholz, A. B., 1877, pl. 79-82. There are several Staats gewerbeschule, 1868-9 by G. Haussmann; and one by Avanzo and Lunge, A. B., 1889, pl. 26-9. Normal school of S. Anne, founded by Maria Theresa. Volksschule für Knaben und Mädchen in Penzing bei Wien; by K. Hintrager, A. B., 1890, pl. 13-4. Realschule in Sechshaus; by V. Luntz, A. B., 1880, pl. 63-6. Kaiserliches Stiftungshaus; by F. von Schmidt, A. B., 1887, pl. 1-11. Handelsakademie; 1860-2 by F. Fellner. Stadtrealschule; 1855 by F. Fellner; 1871 enlarged by G. Haussmann. Schulhaus des Wiener frauernwert vereines; 1873-4, by L. von Mojsisovics. Kommunalschulhaus; 1859 by G. Haussmann; A. B., 1868-9, pl. 85-6.

Museums, etc. Belvedere palace (lower and upper) for prince Eugene of Savoy; 1693-1724 by J. L. von Hildebrand or Hildebrand; from 1776 the lower contained the Ambras collection of armour, antique sculpture; sarcophagus of the Fugger family and a bronze statue of Hermes, both of the best period of Greek art; the Egyptian collection of Dr. Burghardt 1823. The upper palace was the imperial picture-gallery opened 1728; interior decoration by lieut. Du Plessy; the gardens by Girard; modern pictures in the four rooms over. *Résidences mémorables de — héros, etc., des édifices de Eugène*, fol., Augs., 1701. PERGER, *Galerie imp. roy. au Belvédère*, 4 vols., 200 eng. new edit., 4to., Vien., 1821-28. A. B., 1880, pl. 71-5. E. Ritter v. ENGERTH, *Gemälde-Galerie des Kais. Bel.*, fol., Vien., 1890. These art collections are now (1891) combined in the Kunst museum on the ring. Albertina, the splendid palace formerly of the duke of Saxe Teschen and later of his son-in-law archduke Carl, 1801-4 and later Albert; has a library of 40,000 vols., and collection of engravings over 220,000 in 900 portfolios, and over 15,000 drawings. Kunst-gewerbeschule und museum für künste und industrie (ren. in brick); 1868-71 by H. von Ferstel; sgraffito by Laufberger, A. B., 1871, pl. 52-8; 60-1; and 1881, pl. 34-40. *Three industrial museums*, B. J., 1883, xlv, 134. Academie der bildenden künste (Ital. ren.) 1876- by T. von Hansen for 1,000-1,200 students; museum of casts, B. J., 1876, xxxiv, 312-4; A. B., 1876, pl. 1-9; 1879, pl. 27-8a; 1881, xli, 707. Oriental museum on first floor of the new exchange; B. J., 1880, xlv, 880. Akademie der Wissenschaften, 1858 in the old university buildings; 1784 by G. Nack, its fine church dates 1627-31. Central anstalt für meteorologie und erdmagnetismus, ... by H. von Ferstel. Hof-museum or Kunst historisches museum und natur historisches museum; 1872-84 by K. von Hasenauer with suggestions by G. Semper; the competition 1875 in B. J., 1876, xxxiv, 55. DODERER, in *Zeitsch. des österr. Ing.- und Arch.-Ver.*, 1867.

Musikvereinsgebäude or Gesellschaft der musikfreunde (ren. terra-cotta in pediment by Rahl); 1867-71 by T. von Hansen; fine concert-rooms; A. B., 1870, pl. 2-8. Gartenbau-Gesellschaft or Horticultural Society; 18... by A. Weber; saloons for shows, and shops on both sides. Aquarium 1870 by H. Nowak.

Charitable buildings. Allgemeine krankenhaus, general hospital; 1686, 1784, 1834 enlarged; has 9 quadrangles, 131 sick-chambers, and is for 3,000 patients. Krankennanstalt Rudolf stiftung; 1862-5 by ... Horky; A. B., 1866, pl. 3-8. Asylum for the insane; 1848-52 by F. Fellner for 600. Burger spital is extensive. Allgemeine polyklinik; 1782. Foundling; 1784 for 17,000 children, costs £40,000 per annum. Evangelei waisenhaus; by O. Thienemann, A. B., 1874, pl. 45-8. Gebäranstalt or lying-in. Blind asylum; 1804, 1816 enlarged for eighty children. Deaf and dumb asylum; founded 1779. Invalidenhaus; end of XVIII cent. for 800 soldiers. Free children of S. Joseph. S. Annenkinderspital; A. B., 1851, seite 19, p. 16. Privat Heilanstalt des h. Dr. A. Eder; by prof. H. Auer, A. B., 1888, pl. 4-10. Rudolphinum hospital; 1868 for students; BUILDING NEWS *Journal*, 1869, xvi, 128. Josephinum founded 1784, for army surgeons. Thierarznei institut, veterinary college; 1819-22 by J. Aman. Anatomisches institut; by ... Avanzo and ... Lange; A. B., 1889, pl. 32-5. Kaiserliches Stiftungs-haus; four stories with chapel, by F. von Schmidt, on site of the burnt Ring theater. Armenhaus; 1849-50 by Nierstee for 1,400 old people, 541 ft. long. Elisabethinen; 1870-71 for casuals. Israelitische krankenhaus; 200 beds, 1869 by W. Stiassny, pavilion system; and their blindeninstitut 1873; baron Anselm de Rothschild gave 200,000 fl. towards the funds.

Theatres. The new opernhaus; 1861-9 by E. van der Nüll and A. Siccard von Siccardsburg (both died before completion), to seat 3,000; three tiers of boxes; open loggia frescoes by Schwind; cost £500,000; A. B., 1878, pl. 1-16a; B. J., 1869, xxvii, 442; *Wiener mont. baut.*, 1880; Ventilationsfrage, vortrag von prof. SICCARDSBURG, *Wiener baukütte*; WIST, *Studien bauconstruct.*; FÖLSCH, *Theaterbrände, etc.* FARROW at R.I.B.A. Hofschauspielhaus; 1872-88 (ren.) by G. Semper and K. von Hasenauer for 2,000; the frieze by R. Weyer; B. J., 1877, xxxv, 106-8. Komische oper; 1873 by E. von Förster; A. B., 1875, pl. 14-22. Karl national theater; 1847 rebuilt by E. van der Nüll and A. von Siccardsburg. Large staadttheater or theater an der Wien; 1871-2 by F. Fellner. Ring theater; new in 1870 with iron fireproof drop-scene, ARCHITECT *Journal*, July 1870, iv, 28; 1873-4 by E. von Förster, burnt Dec. 8, 1881; B. J., 1881, xli, 754; 1882, xlii, 529. Asphaleia; B. J., 1882, xliii, 587. Hall for the choral societies' festival; 1890 by H. Otte, B. J., lix, 146.

Markets. Schlachthaus, (2); 1861 after the Paris abattoir, Central vielmarkt. Markthalle, 1865 by ... Gabriel, now a general market, 1871 by G. Haussmann. Detail markthallen, by F. Paul; A. B., 1885, pl. 22-7.

Baths. Dianabad; 1804 by C. von Moreau; 1839 and 1842 enlarged by H. von Ferstel and ... Etzel, A. B., 1843, pl. 510-4; B. J., 1851, ix, 138-9; 186. Public baths; 1846 by E. van der Nüll and A. von Siccardsburg. Romischbad on the Prater; 1872 by Claus and Gross, A. B., 1874, pl. 6-10. Städtische badeanstalt for 1,200; A. B., 1880, pl. 53 9. Leopoldstadt baths and wash-houses; in ANNALES DE LA CONSTRUCTION, fol., Paris, 1855, p. 52, pl. 31.

In the vicinity. The Weilburg, 1823 by Jos. Kornhäusel, the summer residence of archduke Charles, façade 660 ft. Schönbrunn imperial chateau; the summer palace rebuilt 1696-1775 by J. B. Fischer von Erlach for emperor Matthias; enlarged 1744 by Pacossi (an old print of the palace has Paccassi, i.e., PAKASSY, as the builder of it) after Valmagni, extensive and of little architectural merit, interior splendidly furnished; 1441 rooms therein. 1810 and 1819 restored by J. Aman and continued so to 1843. Gardens in the French style of XVIII cent. by Steckofen and J. F. Hetzendorf. Conservatories 1820 began

by J. Aman. The Hof theater 1763 by J. F. Hetzendorf. On the hill beyond is the triumphal arch Glorietta, 1775-80 by J. F. Hetzendorf. OEHLER, *Besch. der Lustschlosses Schönbrunn*, Wien, 1805. The schloss Schwarzen in the Steinfeld, *cir.* 1733 by a Fischer. Laxenburg is a so-called Gothic castle erected to please Maria Theresa.

In January 1889, near the river Danube, was discovered a quarry which had been used by the Romans, and at 7 or 8 ft. were found bronze medals and coins, one being of Antoninus Augustus Pius; with wedges and other implements for quarrying; and blocks of stone.

Map No. 211 of the Society for the Diffusion of Useful Knowledge, *cir.* 1835. GRESS UND NEUSSNER, *Grundriss*, 1770. KALLARIUS, *Annales Mont. omnis Aevi Vindel.*, fol. KLEINER, *Vues et façades principales—de V.*, 70 pl., 2 vols., fol. KLEINER, *Vera et accurata delineatio*, 4 pts., 123 pl. and 33 sup., fol., 1724-5. FISCHER, *Brevis notitia urbis Vindobona*, 8vo., 1767-8. SCHUTZ ET ZIEGLER, *Vues de V.*, etc., 70 views, fol., 1790. Von HUBER, *Scenographia*, 1769-72. *Views in V.*, 13 pl. of palaces, markets, etc., 4to., 1747. TOWNSON, *Travels in Hungary*, Vienna in 1793, 4to., 1797.

FREDDY, *Descrizione*, 8vo., V., 1800. KURZBECK, *Nouveau Guide*, 8vo., 1792. BRIGHTZ, *Travels*, Edinb., 1818. BEATTIE, *Danube Illustrated*, 4to., 1844. WEIDMANN, *Neuestes Panorama*, 8vo., Wien. (1838?), and other works on the city. NEUMANN, *Die Barockbauten Wiens—17 und 18 Jahr.*, fol., 1880. HORMAYR, *Wien, seine Geschichte und seine Denkwürdigkeiten*, 9 vols., 63 pl., 8vo., Wien, 1823-5. A. DE LA BORDE, *Voyage pittoresque en Autriche*, 3 vols., fol., Paris, 1821-3. RACZYNSKI, *Histoire de l'art moderne en Allemagne*, 4to., Paris, 1836-41, ii, chap. xvi. BROCKHAUS, *Conversations Lexicon*, 8vo., 1882. WINKLER, *Technischer Führer durch Wien*, 8vo., 1874; a useful work, showing plans and constructions. LÜTZOW und TISCHLER, *Wiener Neubauten*, 2 vols., fol., Wien, 1876-80. *Monumental Bauten*, fol., 1886. FARROW, *Vienna and Buda-Pest*, chiefly acoustics and ventilation, in ROY. INST. OF BRITISH ARCHITECTS, *Transactions*, 1884-85, p. 55-64; and 1888, *Recent Development of Vienna*, p. 27-42, with plates and plans. ILG AND KAABDEB, *Wiener Schmiedewerk des XVIII Jahr.*, *Iron Work*, fol., Dresden, 1878-83. *Going Along*, in BUILDER JOURNAL, 1863, xxi, 717, 733; *Building and Decoration*, 1881, xl, 627; *New Vienna and its Art*, 1883, xlv, 197; *From Vienna*, 1883, xlv, 347. DALY, *Revue Générale*, 1873, xxx, 205, 251-7. *Southern Germany* (Baedeker), 8vo., 1873. *Southern Germany* (Murray), 8vo., 1890. *Zeitschrift des Oesterreichischen Ing.- und Arch.-Vereins*, 4to., Wien, 39th year 1887, gives many buildings. *Wostrenskrift des Oester. Ing.- und Arch. Vereins*, 4to., from 1875.

WIGGE (GYLBEIT), freemason, of Cambridge, with Ralph Symons of Westminster, freemason, 1598-1602 contracted to build the second court of S. John's college, Cambridge, for the countess of Shrewsbury, at the sum of £3,400; and 1617-8 with Henry Mann, the Walnut Tree court of Queen's college; WILLIS and CLARK, *Arch. Hist.—of Cambridge*, 8vo., Camb., 1886, ii, 19; 249; the contract is given in *extenso* p. 250-5.

WIGHTHAM (RICHARD DE), master mason, assigned by the king's treasurer to superintend and direct each of the works of building, and to be the master in the same office, at the palace and mews at Westminster and Tower of London, at 1s. per day; 1307, 7 Aug. to 24 Feb., 1st Edward II. BRAYLEY AND BRITTON, *Palace of Westminster*, 8vo., 1836, p. 110.

WIGHTWICK (GEORGE), born 26 August 1802 at Mold, Flintshire, became a pupil of Edward Lapidge. 1825-6 he studied in the north of Italy; returned, and was for some months with sir J. Soane. In 1829 he settled at Plymouth, where he had a large practice, also in Cornwall and the southwest parts of Devonshire. He was in partnership for a short time with J. Foulston, who retired from practice about 1835. Wightwick designed before 1828, Belmont house, near Plymouth, for John Norman, esq. (ACKERMANN, *Repository of Arts*, etc., 8vo., 1828, xii, 1). 1836 South Devon and East Cornwall

hospital, etc. (LOUNDON, *Architectural Magazine*, 1837, iii, 566). 1838 refitting and improving the church at Crediton, Devonshire. Restored Helleston, or Helston church, Cornwall. 1839-40 new town hall, Plymouth (CIVIL ENGINEER, etc., *Journal*, ii, 397). 1841 Episcopal chapel at Flushing in parish of Mylor (Anglo-Norman). 1844 S. John's church, Treslothan, Camborne, Cornwall (ECCLESIOLOGIST JOURNAL, 1845, iv, 184). 1848 Congregational chapel, Courtenay street, Plymouth (BUILDER JOURNAL, vi, 499). 1850 Plymouth public and Cottonian library (C. E., etc., J., 1850, xiii, 316). He wrote *Select Views of Roman Antiquities*, 19 pl., 1827. *Remarks on Theatres*, 1832; and *Sketches of a Practising Architect. Selection of Vases, Chairs, Altars, and Fragments from the Vatican*, 4to., 1837. *On the effect—to Architecture—of Iron in the construction of buildings in London*; in LOUNDON, *Arch. Magazine*, 8vo., 1837, iv, 277. *The Palace of Architecture, a romance of art and history*, 211 engr., 8vo., 1840; and two Plays. *Modern English Gothic Architecture*, in WEALE'S *Quarterly Papers on Architecture*, 4to., 1845, pt. vii. *Hints to Young Architects*, 8vo. (Weale), 1846, 1847; 2nd edit. 1860; new edit. by Guillaume, 8vo., 1875; 1880. *Principles and Practice of Architectural Design, in Detached Essays*, fol., 1853. *Review of "Modern Painters"* in "The Western Miscellany", Jan. to April 1849, and many other papers. His terms for employment are printed in ARCHITECT JOURNAL, 1850, ii, 28; and reprinted in ROY. INST. OF BRIT. ARCHITECTS, *Journal*, 1891, p. 161. He had three or more pupils. In 1851, he retired to Clifton; 1855 resided at Portishead, Somersetshire; wrote *Life of an Architect* in "Bentley's Miscellany"; numerous communications to the journals; and *Critical Essay on the Architecture and Genius of Sir C. Wren*; prize essay 1858-59, at ROY. INST. OF BRIT. ARCHITECTS, to which institution he gave his MS. lectures with the drawings, and copies of some of his writings. He died in or about Nov. 1872.

WIHAREE. The local name for an excavation or excavated temple in Ceylon.

WILAKS DE HONECORT. See HONECORT (W. DE).

WILBERHTUS "artifex et cementarius" as inscribed on the Norman font at Little Billing church. *Churches of Northamptonshire*, 8vo., 1859, p. 254.

WILCOX (EDWARD), esq., is appended to a print of Harcourt house (i.e., Bingley in 1747), Cavendish square, "as it was drawn by Mr. Archer but built and altered to what it is by E. W., esq." The first stone was laid 1722. The earlier house, if any, was attributed to I. JONES (list v).

WILD or Wilde (CONRAD), of Strassburg, was living about the middle of XV cent.; his seal is given in LANCE, *Diet. Biog.*, 8vo., Paris, 1872, ii, 340.

WILDE (BERNARD DE), born 1691, was town architect at Ghent, where he designed many houses; also the petite boucherie; the Halle aux toiles or draps; and 1721 the vast hôtel de l'octroi (*pak huys*) on the site of the old châtelet. *REVUE DE BRUXELLES* for Oct. 1837, p. 15. GOETGHEBUER, *Mons. etc., des Pays Bas*, fol., Gand, 1827, p. xii of list.

WILDERNESS. Formerly considered one of the greatest ornaments of a fine garden; it should be proportioned to the extent of the grounds; placed not too near the residence; not to obstruct a prospect; chiefly planted with evergreens; and having labyrinthine walks. In small gardens, rising clumps of evergreens arranged to make the site appear larger than it is, with serpentine walks, are proper, as well carried out by Mr. Allen at Bath (1736). MILLER, *Gardener's Dictionary*, fol., 1803. All those parts of grounds which are out of view from the house should be formed into wildernesses, labyrinths, etc. The walks of a wilderness should be never narrower than 10 ft., or wider than 25 ft.; and the walks be so placed as to respect the best views of the country; which with other directions as to planting are given in LANGLEY, *New Principles of Gardening*, 4to., 1728, p. 194.

WILDNESS. A feature opposed to the elegance and refinement of culture, or polished nature; it is occasionally a great

beauty in landscape gardening; as in spots of heath, furze, thorns, or copse, when amid the richer scenery of parks. It will increase in rarity in proportion as countries become cultivated and people civilised; then it will have charms of novelty.

WILFRID, born 634 in Bernicia in Britain, is considered to be the first patron of ecclesiastical architecture in the country; having visited Rome and other cities he became imbued with great conceptions; he built a church of hewn stone at Ipton; and another at Hexham, called the first ecclesiastical edifice on the western side of the Alps; as archbishop of York 669-678 he covered the roof of the church with lead, and glazed the windows. The introduction of whitewash is attributed to him. EODIUS, *Vita S. Wilfrid*, apud Gale, inter xv Scriptores, 8vo., 1858, etc., i, 40-90; cap. xvii, p. 59, 62; and CAXTON SOCIETY, *Vita*, 8vo., 1844, etc. BUILDER *Journal*, 1849, vii, 111a. WRIGHT, *Biog. Brit. Literaria*, 8vo., 1842, 164-84. WALBRAN, *St. W., and the Saxon Church at Ripon*, in Reports of Arch. Society of Yorkshire and Lancashire, v, 63. RAJNE, *Hexham Priory*, SURTEES SOCIETY, No. 46. HODGES, *Abbey Church of S. Andrew's Hexham*, fol., 1888. G. F. BROWNE, *English Sculptured Stones*. Several Saxon towers in the north of England are mentioned in the ECCLESIOLOGIST for August and October 1847, attributed to S. Wilfrid, vii cent., who if he had employed an Italian architect—would hinder the introduction of any "stone carpentry"—but the erection of so many stone towers at so early a period requires some strong direct evidence; FREEMAN, *History of Arch.*, 8vo., 1849, p. 217. 14. 19.

WILHELM (JOHANN), published *Architectura Civilis*, fol., Hamb., 16...; fol., Nur. (cir. 1650), and fol., Frank. am Main, 1662, chiefly on carpentry.

WILHELM (meister), apparently some short time after 1374 was *baumeister* to the Victorskirche at Xanten; having hurt his foot he was replaced about 1375 by meister Conrad (of Cleve). 92.

WILHELMUS and GUILHELMUS. See WILLIAM.

WILKINS (WILLIAM), F.S.A., of S. Benedict's parish, Norwich, was born 1751; had a limited education, but cultivated pursuits especially drawing which led to his after success. He became acquainted with H. Repton, landscape gardener (his son John Adey Repton became a pupil in 1775), who introduced him to lord Moira, for whom he designed after 1789 Donington hall, Leicestershire (Gothic), RICHARDSON, *New Vit. Brit.*, fol., 1808, ii, pl. 35-8; NEALE, *Seats*, 4to., 1822, ii; also Rûg, North Wales, or only a design; 1799 he exhibited at the royal academy "a design for improving the seat of a nobleman in Northamptonshire" (query, Oxberton house by his son). About 1800 he took the Norwich theatre (making several alterations in it, refitted the interior and added a colonnade to the east end), and its circuit, retaining them until his death, *Report of committee of House of Commons on "Dramatic Authors' Act"* passed 10 June 1833; NORFOLK TOUR, 8vo., 1829, ii, 1124-5. He 1792-3 adapted the castle at Norwich for the county gaol, as well as restoring it and Bigod's tower at the east angle; and designed additions to Stanfield hall, Norfolk (Tudor) for revd. George Preston, formerly the house of the Flowerdews, temp. Elizabeth; NEALE, *Seats*, 4to., 1819, iii. He wrote many papers on archaeology; and for the ARCHÆOLOGIA, *On the Venta Icenorum of the Romans, and of Norwich Castle, with remarks on the Architecture of the Anglo-Saxons and Normans*, 4to., 1796, xii, 132-180; *On Melbourne Church, Derbyshire, and the Porticoes in ancient churches*, 1800, xiii, 290-308. Ten drawings of Norwich cathedral, made by J. A. Repton for his master, were purchased in 1806 for £150 by the Society of Antiquaries; *idem*, 1847, xxxii, 405.

He removed cir. 1780 to Cambridge; where 1795 at Gonville and Caius college he altered the master's lodge, cost £3,500 (i, 202); and at King's college, 1798-1802, he carried the spouts of the chapel into the drains (i, 532); and 1811 repaired the battlements of the chapel (i, 531), as described in WILLIS AND

ARCH. PUB. SOC.

CLARK, *Arch. Hist.—Cambridge*, 4to., Camb., 1886, to which work the above references apply. He lived in his own house at Newnham abutting upon Love lane, now absorbed in the Ladies' College; died 1815, and was buried in S. Giles churchyard; there is a marble mural memorial in the church. THE NORFOLK TOUR, 8vo., Norwich, 1829, ii, 1160.

WILKINS (HENRY), of London, studied in Italy, especially Pompeii and Sicily, and published *Suite de Vues pittoresques des ruines de Pompéii, et un précis*, engraved by L. Caraccioli, 37 pl., fol., Rome, 1819. He was a younger son of the above William. 68.

WILKINS (WILLIAM), M.A., R.A., born 31 August 1778, in the parish of S. Giles, Norwich, eldest son of the above; showed great skill as a draughtsman; 1796 became a member of Caius College, Cambridge; 1800 took his degree of B.A. sixth wrangler; 1801 was nominated one of West's travelling bachelors, passed four years in Greece, Asia Minor, and Italy; and was elected a fellow in his absence. Cir. 1806 he designed Oxberton house, near Worksop, Nottinghamshire (Greek Doric) for G. Foljambe, esq., RICHARDSON, *New Vit. Brit.*, fol., 1808, ii, pl. 61-3. 1806 designed Haileybury college, Hertfordshire, for the East India company. 1807 spire to Great Yarmouth church, covered with tinned sheet copper, £1,890; PRESTON, *Picture of Yarmouth*, 8vo., Yarm., 1819, p. 39. 1808-10 new Doric entrance to the lower assembly or Kingston rooms at Bath, burnt 21 Dec. 1820; (1823-5 it was rebuilt keeping the portico, as the royal library, etc., institution by G. A. Underwood). A villa for sir H. D. Hamilton, bart., at North Berwick. 1808 the Nelson pillar, Sackville street, Dublin; WHITELAW, etc., Dublin, 4to., 1818, p. 1102; WRIGHT, *Ireland illustrated*, 4to., 1829, pl. 39. 1809 Grange park, Hampshire, (Greek Doric), for Henry Drummond, esq., and purchased about 1819 by Alex. Baring, esq., on site of house by I. Jones, part of which was kept but transformed in style; NEALE, *Seats*, 4to., 1819, ii; ACKERMANN, *Repository of Arts*, 8vo., 1825, vi, 250; the north wing was added by S. P. Cockerell. 1814-7 Dalmeny, Linlithgowshire (Tudor), for the earl of Rosebery; NEALE, *Seats*, 4to., 1819, vi. 1816-8 Tregothnan, near Truro, Cornwall (Tudor), for Edward Boscawen, viscount Falmouth, NEALE, 1819, i. (1809) began 1817 the Nelson pillar, Great Yarmouth, 144 ft. high surmounted by a figure of Britannia; DRURY, *Great Yarmouth*, 8vo., 1826, p. 90. 1817 Bolhamsell church, Nottinghamshire. A building in the park for sir R. C. Hoare, bart. 1817 obtained the premium for the grand national monument for the army to cost £200,000 (that for the navy was gained by sir R. Smirke, for 100,000), GENTLEMAN'S MAGAZINE, 1817, i, 624. 1820-2 Dunmore park, Stirlingshire (Tudor), for George Murray, earl of Dunmore; NEALE, 2nd ser., 1826, iii. 1821 the new church at Nottingham. 1822-3 the shire hall at Norwich; and 1826 the theatre there.

His works at Cambridge are obtained from WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 8vo., Camb., 1886, to which work the references apply. 1804 prepared designs for Downing college (Grecian Ionic), and 1806-11 carried out the two sides of the quadrangle, cost over £60,000 (ii, 760-2): 1816 altered the Perse school (destroyed 1808) for the Fitzwilliam collection (iii, 199): at Gonville and Caius college, 1815 prepared designs for a new building (i, 189, and iii, 528): at King's college, 1818 designed the new bridge, a segmental arch of 55 ft. span; 1823-8 new buildings (Tudor) of the hall, offices, and provost's lodge on south side, with porter's lodge and stone screen on east side (i, 564): 1821-3 Trinity college, added the new or King's court (Tudor), cost £40,000 (ii, 652-9): 1822 observatory, obtained the second prize (iii, 195). 1823 Corpus Christi college, new buildings (Tudor), with chapel (i, 302), the latter has been altered by sir A. Blomfield. 1825 S. John's college; applied to for a design for a new court (ii, 278). 1829 May to November, library and museums, competition, £100 each, Wilkins, Cockerell, Rickman, Burton: 1830 March to October, Cockerell, Rickman, and Hutchinson,

Wilkins paid £105, Burton did not send in, Wilkins' pamphlet thereon 1831, iii, 102, 103, 111, 114; a fifth room 1837-9 was added by C. R. Cockerell as part of a large design: 1835 Fitzwilliam museum, competed for the building (iii, 204); and general summary of his work at Cambridge (iii, 564).

1826 with P. J. Gandy-Deering he exhibited at the R.A. a model of the "Tower of Waterloo, 280 ft. high, as selected by the committee of Taste." 1827 he was appointed architect to the East India company in succession to S. P. Cockerell; and about 1828 designed considerable alterations at the house in Leadenhall street. 1828, reported on the piers of the central tower of Sherborne church; CARPENTER, in R.I.B.A., 1877, p. 148. 1828 mansion at Bylaugh, Norfolk, for Edw. Lombe, esq. 1829 portico to King Weston, Somersetshire, for W. Dickenson, esq., M.P., BRITTON, *Bath, etc.*, 4to., 1829, p. 52. In London, 1822-6 he designed the United University club house, Pall Mall east, with P. J. Gandy-Deering, costing £26,500 (the attic story was added in 1850-1), ACKERMANN, *Repository of Arts*, 1827, x, 306; BRAYLEY AND BRITTON, *Public Buildings*, 8vo., 1828, p. 130. 1827-8 London University college and school, Gower street, *idem*, p. 77. 1827-8 S. George's hospital, Hyde Park corner; LEEDS, Supp. to Brayley's work, 8vo., 1838, p. 41; and 1832-8 the National gallery to cost £50,000, it cost £96,000, *idem*, p. 51; PENNY MAGAZINE, 1836, v, 466 and plan 469; PURSER, *The Prospects of the Nation, etc.*, a reply, 8vo., 1833; and GWILT, *Observations on the communication of Mr. Wilkins to the "Athenaeum"* of 16 Feb., 8vo., 1833.

In 1834 he submitted a design for the duke of York's column, Waterloo place; and 1836 competed for the Houses of parliament, and wrote *Apology for the Designs of the new houses of Parl. marked Phil. Archimedes*, 4to., 1836.

His other writings comprise:—*Account of the Prior's Chapel at Ely*, 6 pl., in ARCHÆOLOGIA, 1801, xiv, 105. *John of Padua and Porta Honoris* 1809 at Cambridge, in the VETUSTA MONUMENTA, fol., vol. iv, 3 plates. 1807 published *Antiquities of Magna Græcia*, fol., Camb., 1807; containing Syracuse, Agrigentum, Agræta, and Paestum (their accuracy was impugned by L. von Klenze); *Atheniensia, or remarks on the buildings at Athens*, 41 pl., 8vo., 1812, and fol., 1816; *The Civil Architecture of Vitruvius*, a translation, prefaced by *A History of the Rise and Progress of Grecian Architecture*, 41 pl., fol., 1812 and 1817. *Prolusiones Architectonicæ*, essays on subjects connected with Grecian and Roman Architecture, 40 pl., 4to., 1827; and 1837. In 1824 he was elected A.R.A., in 1826 R.A., and May 1837 was appointed professor of architecture but did not lecture; and 1817 was a member of the Society of Dilettanti. J. H. Stevens was a pupil. Wilkins lived for many years at No. 36 Weymouth street, London; and died 31 August 1839 in his own house "Lensfield", at Cambridge; he was buried in the crypt under the sacristy of the chapel of Corpus Christi college, in that town. CIVIL ENGINEER, ETC., *Journal*, 1839, ii, 388: 1847, x, 382. *A Word for Wilkins*, in *Builder Journal*, 1864, xxii, 499. *ARCHITECT Journal*, 1886, June 4, p. 138-9.

14. W. P. R. R. R.

WILKINSON (GEORGE), practised at Dublin, designing many of the workhouses and lunatic asylums in Ireland. Such as before 1842 Kinsale Union workhouse; 1843 the poor-house at Carlow; 1858-9 the station in Dublin of the Dublin and Wicklow railway, 129 ft. frontage, *BUILDING NEWS Journal*, iv, 214. 1860 largely added to the court-house at Castlebar, co. Mayo (designed by G. Papworth of Dublin). He published the useful work, *Practical Geology and Ancient Architecture of Ireland*, 8vo., London, 1845. He left Dublin about 1838, and resided near Twickenham, where he died soon after.

WILKINSON (NATHANIEL), of Worcester, "an uneducated mason", 1730 repaired Edgar's tower; as architect to the cathedral he in 1748 rebuilt the north end of the great cross aisle, and some windows. About 1760 he built the spire of Ross church, Herefordshire; the spire of Ledbury church; 1760 the "beautiful" spire of S. Andrew's church at Worcester, the

height from parapet being 155 ft. 6 ins., 20 ins. thick at the base, and 6½ ft. in diameter under the cap holding the weathercock; it was completed by his son: the spire of Mitchel Dean, Gloucestershire, and that of Monmouth church. He died September 28, 1764, and was buried in S. Peter's church. CHAMBERS, *Biography of Worcester*, 8vo., Worc., 1820, p. 352.

WILLEDEN PAPER. See WATERPROOF PAPER.

WILLESFORD. See WELLESFORD QUARRY.

WILLIAM. See also WILHELMUS and WILHELMUS.

WILLIAM. Abbot of Dijon, i.e., Sanctus Guglielmus, abbot of S. Benigne in Dijon who 1001 personally directed the works and assisted by a monk Humaldus, selected on account of his expertness in the arts. ACHERY, *Spicilegium*, ii, 383-4, fol., Paris, 1723. WHITTINGTON, *Historical Survey*, 8vo., 1811, 2nd edit., p. 49; RAMÉE, *Histoire de l'Arch.*, 8vo., Paris, 1843, ii, 139. 19.

WILLIAM, 1175-8, i.e., Willclmus Senonensis; see SENS (W. OF).

WILLIAM. Ingeniator, 1197, at Norham; *BUILDER Journal*, 1863, xxi, 499.

WILLIAM Tedesco. See INNSBRUCK (W. VON).

WILLIAM, the clerk of Windsor, 1223 was master of the works at the castle with John le Draper; POYNTER, *Illustrations*, fol., 1841.

WILLIAM (magister) pictor. 1251 was employed to paint figures of the apostles in the king's cloister at Windsor castle. In later rolls the name of William, monk of Westminster, and William of Florence, occur, apparently the same person. In 1248-60 several payments are made to him to buy colours for and to paint the king's chapel; Rot. Lib., 32 Henry III, m. 9; he was paid 2s. per day. WALPOLE, *Anecdotes*. TIGHE AND DAVIS, *Windsor Castle*, 8vo., 1858, i, 71, 75, 77, 80.

WILLIAM of Alnewyck, at Norwich, 1426-50. See ALNWICK (W.).

WILLIAM of Avignon, i.e., Guilhaume at Prague, 1333. See GUILHELMUS.

WILLIAM of Canterbury, i.e., Gulielmus Anglus, the Englishman, 1179-81. See SENS (W. OF).

WILLIAM of Coventry; apparently an error in DALLAWAY, *Discourses*, 8vo., 1833, p. 43, for WALTER.

WILLIAM of Croyland, 1392-1417. See CROYLAND (W. OF).

WILLIAM of England. The church or cathedral at S. Jean d'Acre was perhaps built 1190 by William an Englishman; it is said to be like the Early English style and to be the only one with pointed arches; by MILNER, *Essay*, 8vo., 1811, p. 57.

WILLIAM of Modena, sculptor of bas-reliefs, etc. See VILIGELMUS.

WILLIAM of Pisa; i.e., Guglielmo da Pisa. See AGNELLI (fra G.).

WILLIAM of Verona. See VERONA (G. DA).

WILLIAM of Wykeham. See WYKEHAM (W. OF).

WILLIAMS (...), surveyor to the Bridewell and Bethlehem hospitals; died Dec. 12th, 1780; J. Lewis succeeded in 1793.

WILLIAMS (GEORGE BARNES) born 1817, became a pupil of G. Smith, and with him 1860 designed the printing-offices in Pilgrim street, Ludgate hill; became his partner, and on his death in Jan. 1869 was appointed to succeed him as surveyor to the Mercers' company, for whom he designed the long frontage and block of buildings on the north side of Cheapside, including the restored entrance to Mercers' hall. He was also surveyor to the Vintners' company, for whom he carried out extensive alterations at their premises in Lower Thames street, where he also designed the hall of that company. He was also surveyor to the Coopers' company. He was district surveyor for Plumstead and Eltham. He died 23 June 1887, aged 70, at his residence at Lee, where his widow has 1891 erected an institute for men and boys in memory of him.

WILLIAMS (perhaps J...), was 1799 in the office of Thomas Hardwick; 1803 exhibited a villa for the duchess of Devonshire; 1804 a villa on Sydenham common; 1805 Bunney church, Nottinghamshire, and other designs; 1807 a chapel on

Sydenham common; and a design in 1810. In 1812 he was awarded the first premium of £200 for a design for the penitentiary prison at Millbank, London; ACKERMANN, *Repository of Arts, etc.*, 8vo., 1812, viii, 157; *BUILDER Journal*, 1868, xxvi, 181: it is now destined to be pulled down.

WILLIAMS (HERBERT), born 1812, was a pupil of Samuel Angell, and afterwards an assistant in his office. He commenced practice about 1838, and carried out at Brighton, 1842-8, the parochial schools for 300 children, with chapel, the dispensary, female orphan asylum, and 1852 Sept. additional wings and a chapel to the Sussex county hospital, cost £6,244; assisted S. Beachcroft as district surveyor at Chelsea; 1855 was elected surveyor to the Drapers' company on the resignation of W. J. Booth; 1858 offices at corner of Feuchurch street and Billiter street (*BUILDING NEWS Journal*, iv, 601); 1855-8 orphan girls' schools at Llandaff, and at Denbigh (*BUILDER Journal*, xvi, 252) for the Drapers' company, and other buildings for them, as 1860-2 the Elms, boys' school and twenty-four almshouses at a cost of £17,580; and 1866-70 nearly entirely rebuilt their hall in Throgmorton street, London. 1861 No. 13, Lamb's Conduit street; and 1863 villa for S. Smiles, esq., at Lewisham at a cost of £3,700. In conjunction with sir G. G. Scott, he 1858-60 carried out the modernisation of the church of S. Michael, Cornhill, for the Mercers' company, B. J., xvii, 435; B. N. J., v, 4, 759; and *Specimens of Executed Examples of Eccles., etc., Structures*, 4to., 1858, pl. xiii. He died 5th October 1872, aged 60.

WILLIAMS'S SLATE RIDGE AND HIP. The patent is explained, and the method of fixing is shown, in *BUILDER Journal*, 1845, iii, 165, and is still manufactured.

WILLS (FRANCIS) of Exeter, 1845 designed the monument to Richard Hooker proposed to be erected in S. Mary's yard, at Exeter; and 1845 the cathedral at Fredericton (s. v.) in Nova Scotia, *ECCLIOLOGIST Journal*, 1846, v, 81; viii, 330; 1852, xiii, 295, 352; *ILLUSTRATED LONDON NEWS*, 1849, xiv, 276, 370. He designed Christ Church cathedral at Montreal, and laid 21 May 1857 the foundations, but dying in 1857 it was adopted by T. S. Scott his successor; *BUILDER Journal*, xv, 466, 543; view xvi, 26. He also designed other important edifices both in the British provinces and the United States.

WILLSON (EDWARD JAMES), F.S.A., born 21 June 1787 at Lincoln, son of a talented builder there, and worked under him for a short time. Among the restorations of numerous parish churches obtained through the interest of the archdeacons Bagley and Goddard of Stow, is 1823 that of Messingham church, Lincolnshire; 1826 designed the organ case for Lincoln cathedral, and was occasionally consulted in the repairs. His many writings of an early period showed an intimate acquaintance with the medieval architecture and archaeology of England; thus he assisted BRITTON in *Architectural Antiquities*, 4to., 1807-14, by writing the accounts of Boston church, S. Peter's Barton; Beverley and Lincoln minsters. Also in *Cathedral Antiquities*, 4to., 1814-35; and *Picturesque Antiquities of English Cities*, 4to., 1830. He supplied materials to, and advocated the improved delineation of details shown in, PUGIN, *Specimens of Gothic Architecture*, 2 vols., 4to., 1820; 1823; and compiling for it the first *Glossary of Mediæval Technical Terms*, 1820, 1823, 1838; and for PUGIN, *Examples of Gothic Architecture*, 2 vols., 4to., 1831-6. He held the appointment of county surveyor of Lincoln castle for over twenty years, and wrote a *Report on the Present State of the Outward Walls, etc., of the Castle*, presented 1 Jan. 1835, and restored the keep and walls, cir. 1845. He contributed the opening address *On Topography*, Feb. 23, 1841, in the only volume of the *Transactions of the LINCOLNSHIRE TOPOGRAPHICAL SOCIETY*, 4to., 1843; much assisted the "Archæological institute" at the 1848 meeting at Lincoln; and contributed a paper to the volume thereon. He died September 8, 1854, at Lincoln, aged 67, and was buried at Hainton, leaving two sons, one of whom is Thomas John Willson, F.R.I.B.A. Memoir by J. Britton, in *BUILDER Journal*, 1855, xiii, 4-5. *GENTLEMAN'S MAGAZINE*, March 1855.

WILNA. See VILNA, in Russia.

WILSFORD. See WELLESFORD QUARRY.

WILSFORD (THOMAS), wrote *Art of Building, or an Introduction to all Young Surveyors in Common Structures*, 8vo., London, 1659.

WILSON (CHARLES), born 19 June 1810, the son of a builder of Glasgow, 1827 became a pupil of, and then chief assistant to, David Hamilton of that city, during some of his best works. In 1837 he began practice by designing at Glasgow—Hutchesontown church, Hospital street; 1839 church at Strathbungo; another (Greek) in Calderwood street; 1842-3 the royal lunatic asylum at Gartnavel; 1845 Windsor terrace in Great Western road; and the Glasgow academy, now the High school, perhaps his best design; 1848 Shandon house, Gareloch; the southern necropolis; Free S. Peter's and S. Stephen's churches; 1850-1 royal bank buildings, Buchanan street; 1854 Faculty of Procurators' hall, West George street (Italian), *BUILDING NEWS Journal*, 1860, vi, 679, 683; laid out Kelvingrove park in conjunction with sir J. Paxton, and designed Park terrace, gardens, circus, and granite stairs; 1856 Free church college and college church (Italian); Queen's rooms (Italian), and buildings of La Belle place. At and near Dundee, he 1851 designed a house for W. E. Baxter, M.P.; 1850-1 for misses Jobson; 1852-3 Lochton house, and Tudhope house, near the city; and Free S. Peter's church; 1854 a house for Edw. Baxter; 1858 for W. E. Armitstead; and Thornliebank house at Thornliebank; 1848 Lewis castle at Stornoway; and Raasay castle, island of Raasay. 1848 at Rutherglen, the Free church; 1861 Wester Moffat house; and the town hall, both Scotch baronial. 1843 Rothesay Free church, and 1847 Dr. Elder's church. Melrose Free church. At Oban, 1862 the Great Western hotel; and Free College church. 1848 at Paisley, the Nelson institution: Mr. Steel's house at Greenock near the sailor's home. Eastwood parish church, not completed. Also a great number of other churches, first-class mansions, and town properties. He had been president of the Glasgow Society of Architects. He died 5th Feb. 1863, at Glasgow, aged 50. *BUILDER Journal*, 1863, xxi, 173. Memoir by D. Thomson (for a long time his principal assistant), read before the Architectural Section of the Philosophical Society of Glasgow, 13th March 1882, which gives a critical examination of his master's works.

WILSON (THOMAS), of Bishop Wearmouth, was the architect 1790 to Rowland Burdon's iron bridge at Sunderland over the river Wear, 180 ft. span; LARDNER, *Cabinet Cyclopædia, Metal*, 8vo., 1831, i, p. 66: and 1800 Staines bridge, over the Thames, which sank from weakness of abutments about a month after; *MIRROR Journal*, 1832, xix, 322. The new bridge designed by G. Rennie, C.E., is given in CRESY, *Bridge Building*, fol., 1839, pl. 18-9.

WILSON (THOMAS), 1801 gained the gold medal for architecture at the royal academy of arts in London.

WILSON (sir WILLIAM, not Thomas), builder and architect, born at Sutton Coldfield, Warwickshire (or at Leicester); built Four Oaks hall, for lord fiolliott (in 1808 it belonged to sir E. C. Hartop, bart.). He married the widow of Henry Pudsey (? of Lancashire) and through her influence obtained knighthood 8 March 1681; and after her death he carved the equestrian statue at Nottingham castle of its owner the duke of Newcastle (MARSH, builder, under J. or H. SMITHSON); and carved the colossal figure of king Charles II in the west front of Lichfield cathedral. In 1695-1704 designed the tower, nave, and transept of S. Mary's church, Warwick, after the fire of 5 Sept. 1694; cost £4,874 9s. 5d.; it is also attributed to sir C. Wren, he having been first engaged, but his drawings at Oxford "are totally different", as stated in *ARCHÆOLOGICAL JOURNAL*, 8vo., 1846, ii, 110, reviewing *Notices of the Churches of Warwickshire*. It was probably built by James SMITH of Warwick. Wilson died in 1710, aged 69, and was buried at Sutton Coldfield. WALPOLE, *Anecdotes, etc.*, edit. 1849, ii, 626. *The Forest and Chase of*

Sutton Coldfield, 1860, p. 101. GOULD, *History of Freemasonry*, 4to., 1884, iii, 143, showing that he 1682 belonged to the masons' lodge at Warrington; *BUILDING NEWS Journal*, 1877, xxxiii, 173.

WIMBLE. A tool, a large auger, being a piercer wherewith to bore a hole (Lat. *PENETRALE*; Scotch, *Wummil*). BRACE STOCK. RESTWOMYLL. WOMBLE and Wymbyll.

WIMBOLD, Wimbolde, and Wirmbolde, *cementarius* about 1078. See Odo. 10. 19.

WIMMEL (CARL), studied at Carlsruhe under F. Weinbrenner, whence he went to Paris, and to Italy and studied the ruins. In 1818 he became *stadt baumeister* at Hamburg, where he designed many public and private buildings, in which he used the round arch; 1840 the fine *börse* or exchange begun by his clerk of the works (*conduteur*) Forsmann, and completed 1841 by Wimmel (arcades have been added by A. de Chateauneuf); 1837-9 the gymnasium or high school and library with Forsmann completed 1840, *ALLGEMEINE BAUZEITUNG*, 1839, pl. 292-4; the meat market; *idem*, 1847, pl. 119; with the Berlin and Lubeck gates. The infirmary, lunatic asylum, and the house of detention were his own works. A. de Chateauneuf was a pupil 1816. The date of his death is not found. 68.

WIMPOLZHEIM (meister HANS VON). See HANS.

WINCESTER (JOHN), 1581 "master friemason" to king James VI of Scotland (during his minority) and 22nd queen Elizabeth; he subscribed the attestation and set his mark to it; GOULD, *History of Freemasonry*, 4to., 1882, i, 90.

WINCHESTER (Anc. Brit., *Caer Gwent*, or white city; Rom. *Venta Belgarum* from the Belge; Germ. *cir.* 660 *Vintanceaster*; the Saxon capital of Wessex, *Wintanceastre*; Lat. *Wintonia*). A city in Hampshire, in the south of England, situated on the river Itchen, crossed by a handsome stone bridge of a single arch. Coins of III and IV centuries, vases and utensils, pavements (*BUILDER Journal*, 1880, xxxix, 275), have been dug up, and drums of columns, and bricks, found built in the Norman walls of Wolvesey; six Roman roads lead from the city. "Thanks to the resistance of king Æthelwulf, the northern pirates made Winchester the chief city of England, for Wessex stood its ground; under Cnut 1013-35 it became the seat and capital of the new Scandinavian empire; and in 878 it rose to be the capital city of the English people and the residence of Alfred"; (KITCHEN). Edgar ordered "Let one weight and one measure be used in all England after the standard of London and Winchester", setting the two capitals on a footing of complete equality; the "Winchester bushel" is still preserved. Edward the Confessor wore the crown yearly at Winchester, Gloucester, and London; Henry II gave up the custom and treated Winchester as the capital. In 1200 the Jews flourished there and lived in peace. In Henry I's time the suburbs extended for a mile on each side from the city walls. Portions of the walls and ditch remain; it had five principal gates (*BRITISH ARCHITECT Journal*, Feb. 6, 1891, p. 97); the West gate is a valuable specimen of the military architecture of Henry III; King's gate 1266 has Little S. Swithin's church over it rebuilt XVI cent.; the north and south gates were removed 1781 and the east gate in 1791. The castle or palace, the headquarters of William I and of the monarchs to Henry III, was erected on part of the grounds of New Minster, founded by bishop Henry of Blois; the latter monarch 1222-6 made great additions and decorations under Elias de Dereham or Helias de Berham (SMIRKE in *ARCHAEOLOGICAL INSTITUTE* at Winchester, 8vo., 1846; and TURNER, *Domestic Architecture*, 8vo., Oxford, 1851, p. 176, 183). The great hall, sometimes called the chapel, 111 ft. by 56 ft. 3 ins., and fragments of a subterranean passage remain; used as a fortress, the castle was taken and blown up by O. Cromwell and 1646 the fortifications destroyed; the parliament granted it to sir W. Waller by whose family it was sold to the city for a public hall for the county. Part of the site was reconveyed to Charles II, who 1683-5 had the "king's house" designed by sir C. Wren, built of red brick by Edward Strong, mason, as part of a palace, at a cost of £25,000; the pillars of Italian marble for the staircase leading

to the grand guardroom were given to the duke of Bolton by George I; a stately approach to the west door of the cathedral was included in the scheme (*UNIVERSAL MAGAZINE*, 1757, xx, 332 and plate); the building is now used as barracks for 2,000 men and dépôt. The hall was new-roofed and repaired, the old gable windows restored, under T. H. Wyatt, who 1871-5 designed the new assize courts and county hall, described by him with the castle in *ROYAL INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1873-4, p. 157-69.

Winchester was made an episcopal see in 662; the cathedral dedicated to SS. Peter, Paul, and Swithun was founded VII cent.; rebuilt 966-71 by bishops ÆTHELWOLD and EPHEGE, and highly praised by Wulfstan; its eastern part with the crypt and apse and the sacred well under the altar, may have existed up to the time of bishop Lucy's work, and this part with the transepts were not included in the rebuilding of the cathedral 1079-93 by bishop Walkelin; a nave of eleven bays, 250 ft. long and 78 ft. high, transepts of four bays, eastern arm of four bays, 40 ft. wide. The joints of Walkelin's stonework were pointed with a broad square band of excellent mortar fully one inch wide neatly squared, and only the vaulting was plastered; the oak roofing of the south transept and of the nave west of the tower (except for 50 ft. from the west end which was burnt) still remains, it was obtained from Hanepinges now Hempage wood, or Hampnage, about four miles eastward, the tiebeams 36 ft. 3 ins. plus 3 ft. bearing at each end are 42 ft. 6 ins. long, and 18 ins. by 12 ins. The central tower fell in 1101 or 1107, and was rebuilt 1200 of late Norman style 138 ft. high; the weathercock fell 1214 and broke the shrine of S. Swithun. The foundations of a building 157 ft. 1 in. long by 55 ft. outside, placed 26 ft. 5 ins. to the north of the north transept may be the first Saxon cathedral, or the Saxon building of the "New minster" founded 966 by king Edgar (charter in the British Museum), built by the kings Alfred and Edward (plan in B. J., 1886, I, 259, 295, 321); its abbot and twelve monks fought 1066 at Battle. In 1845 was found a bed of concrete for 50 ft. from the west front evidently for two large towers of Walkelin's building; WILLIS in B. J., iii, 447-8; it was again opened in 1862, B. J., xx, 190. Henry of Blois (died at Cluny 1159) stored up the classical statuary and carved work gathered by him at Rome; built a treasure house in the aisle where nave and south transept were, of which two curious arches and pilasters remain. The chantries and chapels of the east end were begun by bishop Godfrey de Lucy (1189-1204) who in 1202 formed a "fraternity" for five years for the works; being the low-roofed aisles and chapels (GARBETT considers he underpinned portions of the old work), and the national square east end to the choir. The Lady chapel windows and vaulting of lierne work, with later Perpendicular work have the rebuses of priors Hunton and Silkested (1470-98-1524), PEGGE, *Inscriptions*, 4to., 1787, in GOUGH, *Bib. Top. Brit.*, 4to., vi, 86. 1280 the presbytery from the tower up to and including the altar screen begun by bishop Nicholas of Ely. Bishop William of Edington (1345-66) formed the great west window, the one in each of the aisles, and the two first from the west end, his chantry, and the part of the presbytery 1320-50, between the tower and altar screen. Bishop William of Wykeham (1367-1404) transformed the nave and transepts (the north side and vaulting were completed after his death) from the Norman into the Perpendicular style, by direction of William Wynford his master mason, with S. Membury, supervisor and paymaster; (the triforium was removed; HOLK, in vaulting); also his chantry, restored 18... by his two colleges of Winchester and Oxford. The chantries of cardinal Beaufort (1405-17), and of William Waynflete (1447-86). In 1486 the crypt was filled up with about 4 ft. of chalk, this was removed 1886. Bishop Fox (1501-28) carried up the two turrets at the eastern extremity of the presbytery, and the large window between them with the work over it; also the aisles north and south of the presbytery; and his chantry. The chantry of S.

Gardiner (1531-56). Minstrels' gallery. The oak screen of choir dates 1875 by sir G. G. SCOTT, *BUILDER Journal*, 1875, xxxiii, 194; oak stalls of choir date *cir.* 1296 or early Decorated period, COLLING, *Gothic Ornaments*, 4to. (1848-50); STREET, *Old English Woodwork of XIII and XIV cents.*, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1864-5; and stone canopy of presbytery, Decorated period, (*BUILDER Journal*, 1849, vii, 30). The pulpit was given and inscribed by prior Thomas Silkstede (1498-1524). The throne was designed by E. Garbett. The glass of the east window was put up for bishop Fox just previous to 1525 and is very good. The reredos, end of xv cent., was somewhat damaged 1627 for a fitting by I. Jones; 1885-7 it was restored and statues put up under sir G. G. Scott; *BUILDING NEWS Journal*, 1864, xi, 339; *BRITISH ARCHITECT Journal*, 13 March 1891, p. 210; completed by J. D. Sedding. The black marble font is xii cent. "and of the same kind as that at Lincoln" (*VETUSTA*, 1786, ii, pl. 39), which with those at East Meon, and S. Michael's church, Southampton, may all be the work of the same sculptor. The length of the cathedral from plinth of buttress of east wall of Lady chapel to plinth of west porch is 557 ft. 9 ins.: the nave of eleven bays, 265 ft., is the longest in England, according to NEALE, *S. Alban's*, fol. 1878, and with the eastern chapel it is 520 ft. long inside; the transepts, 186 ft. or 225 ft. long, are double ailed; SCOTT, *Lechurches*, 8vo., 1879, ii, 104, 109-112.

Restorations were commenced 1860-1 under J. Colson, and a new figure put up in west gable, B. J., 1861, xix, 11. From the scriptorium over Walkelin's cloister, came forth for centuries the beautiful illuminated MSS., of which the Vulgate of the end of xii cent. is still the pride of the cathedral library. Bishop Horne (1561-80) cleared the statues, the chapter-house (fragments remain), with the cloisters, to avoid expense of repairs. Walkelin used the grey, coarse, shelly limestone from Quarr, in the Isle of Wight; also used in the works by Edington and Wykeham, but Beer stone for moulded and carved work, which has not always stood well; prior Silkstede (1498-1524) filled in the west windows of north transept with tracery of Quarr stone; the great reredos seems Tisbury stone. Fox used Beere stone. Caen stone in restoration 1860 of west front; and Douling stone 1876 now for all external works.

The deanery, *temp.* Henry III, has the ancient walls, roof and flooring remaining; it with the houses of seven prebends were 1670 demolished; two more greatly pulled down, and three out of repair; the stabling is of timber; former hospice or strangers' hall exists, and the garden is the site of the Chapter-house. Three canons' houses were rebuilt at end of xviii cent. The Close houses, etc., 1661 were repaired or rebuilt; the prior's house divided into three rooms; stairs and hall added outside, and a long gallery added in the dean's garden.

The ancient church of S. Lawrence, with a lofty tower, formed part of the king's palace. S. John the Baptist's church, beyond the river, is Early English; the screens xiv cent.; squints and glass; the Perpendicular tower is at the end of south aisle; BAIGENT, *The Paintings*, in *Journal of BRIT. ARCH. ASSOC.*, 8vo., 1864, ix, I. S. Giles's church around which the great fair was held for sixteen days, confirmed 1349. S. Peter Colebrook, tower at south-east angle; a Norman font. New vicarage for parish of S. Faith; B. J., 1875, xxxiii, 1114. S. Thomas and S. Clement, 1845-6, by E. Elmslie, cost £8,500; view in *ARCHITECT Journal*, 1849, i, 73. S. Maurice, modern with an old tower. S. Mary's college founded 1387-93 by William of Wykeham; chapel with wood fan vaulting, chantry chapel 1430 adjoining is since 1629 the library, with a scriptorium over (untouched), the hall 50 ft. by 30 ft., audit room, kitchen and cloisters date about 1430; the tower 1420, was repaired by J. Essex, but the piling of the foundations proving defective it was rebuilt 1862-63 by W. Butterfield; B. J., 1862, xx, 322; 1863, xxi, 557. School-room 1687, cost £2,592, is 90 ft. by 36 ft. Masters' residences in connection with the college, by G. E. Street, Slater and Carpenter, with others

by J. Colson. Moberly library attached, opened July 1870, by W. Butterfield, is 86 ft. by 21 ft. by 23 ft. high; RADCLIFFE, *Memorials*, fol., Win. (1847?); COCKERELL, 1845, s. v. PROPORTION (p. 182); c. W., *College*, 4to., Oxford, 1848; WALCOTT, *W. of Wykeham and his Colleges*, 8vo., London, 1852; ADAMS, *Wykehamia*, 8vo., Oxford, 1878; MOBERLY, *Life of W. of W.*, 8vo., 1887. Diocesan training college 1861-2 for fifty-six students, by J. Colson, £7,500, of Swanage stone; *BUILDER Journal*, 1861, xix, 269. College of matrons on north side of churchyard, was founded 1672.

Old Guildhall 1711-13 with its turret and curfew bell is now a shop and museum; the new Guildhall 1871 by Jeffery and Skiller of Maidstone and Hastings has a hall 80 ft. by 45 ft.; *BUILDING NEWS Journal*, 1871, xx, 386. Hampshire hospital of S. John, founded 1737 was the first one erected out of London, built 1759 and rebuilt 1863-7 by W. Butterfield on site above the town; B. J., 1863, xxi, 833. The Butter now City cross, before 1440, 43 ft. high, was restored 1863-9 by sir G. G. Scott, *BUILDER Journal*, xxi, 416, 573, 591; xxii, 779; xxiii *pass.* New County gaol *cir.* 1805 by G. Money Penny. Bridewell 1800. Market house 1772 and again 1863; B. J., xxi, 416. School of Art 1876 (Gothic) by Stopher, over £2,000. Old Pent house. Corn exchange by O. B. Carter, COMPANION TO THE ALMANACK, 1839, p. 246. Hampshire banking company's premises 1860 by ... Critchlow. S. John's house, once the Templars', is now used for public assemblies and concerts, and part as almshouses. Peter Symond's college or Christ's hospital, of rich brickwork founded 1607; and S. John's for fourteen inmates 1842 by J. Colson, cost £3,600.

Wolvesey castle in ruins, now Winchester house, to the south of the city, was at first a royal rather than an episcopal palace, erected 1138 by Henry de Blois; destroyed *temp.* Henry II; and by Cromwell 1646; in 1684 bishops Morley and Trelawny built a house adjoining; 1721 it was partially in ruins; the west wing is used as an occasional residence: WARNER, *History of Hampshire*, 8vo., 1793, i, 270; B. J., 1876, xxxiv, 1180. Coitebury mill with a curious roof ridge. Hyde abbey founded by Alfred, burnt *temp.* Stephen, has been nearly used up as a quarry. Hospital of S. Cross, founded 1136 by Henry de Blois, bishop of Winchester; reformed by William of Wykeham; and enlarged by cardinal Beaufort; the south lodgings were taken down about 1788. The chancel of the church was 1864 restored by W. Butterfield; B. J., 1865, xxiv, 763 view; DOLLMAN AND JOBBINS, *Ancient Domestic Arch.*, 4to., 1861-4; a view of the gate and interior of the hall in ILLUSTRATED LONDON NEWS, 1845, vii, 193; a strong room formed in Beaufort's room in his tower; and four more houses built on north side, by H. C. Brown, surveyor to the hospital; B. J., 1858, xvi, 558. MILNER, *Hospital*, 12mo., Win. (1840); 22nd edit. (1850). MOODY, *History, etc.*, 8vo., Win. (1840). HUMBERT, *Memorials*, 4to., Win., 1868. The Mize maze on S. Catherine's hill, 86 ft. square, is drawn by Trollope, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1857-8, p. 262; and given in *Illustrations*, pt. 1, 1867, pl. 130. Magdalen chapel, near the town is given in *VETUSTA*, fol., 1790, iii, 3 pl. 14. 15. 28. 96.

WARTON, *Hist. and Antiq.*, 2 vols., 12mo., Win., 1750, 1773, and 1857. RUDBORNE, *Historia major de fundatione—Winton.*, in WHARTON, *Anglia Sacra*, fol., 1691. MILNER, *Hist. and Survey of W.*, 2 vols., 4to., 1798-1801; MILNER, *Hist. and Critical Account of the Cath.*, 8vo., Win., 1801; 9th edit., 1830; and *Historical and Descr. Guide*, 12mo., 1825, 11th edit., 1851. HYDE, earl of Clarendon, *Cath. Church with Tombs, etc.*, 8vo., Lond., 1715. WILLIS, *Survey of the Cathedrals*, 4to., 1742. C. BAILEY, *Transcripts from the Municipal Archives of W.*, 8vo., 1856. BALL, *Hist. Account of W.*, 4to., 1818, the drawings by C. F. Porden. BRAMSTON AND LEROY, *Historie Winchester, England's first capitul*, 8vo., 1882. KITCHEN, *Winchester (Historic Towns)*, 8vo., 1890. WINKLE, *English Cathedrals*, 8vo., 1836-8. LELAND, *Collectanea*, 8vo., Oxford, 1770, i, 116. BRITTON, *Architectural Antiquities*, 4to., 1817. *Vetusta Monumenta* of the Society of Antiqua-

ries, ii, gives 1789 the chantries of Beaufort, Wainflete, and Fox. WEALE, *Quarterly Papers on Architecture*, 4to., 1844-5. MUDIE, *History of Hampshire*, 1839; WARNER, *History of Hampshire*, 8vo., 1793. GODWIN, *Ancient Structures in Winchester and Romsey*, in CIVIL ENGINEER, ETC., *Journal*, 1843, vi, 414. *Picturesque Memorials*, 4to., Win., 1830. JEBB, *New Winchester*, ..., 18. RADCLIFFE, *Memorials of W. Cathedral* fol., Win., 1847. WILLIS, *The Cathedral*, read at the Archaeological Association, given in *BUILDER Journal*, 1845, iii, 458; and in the "Winchester volume", 8vo., Oxford, 1846. WALCOTT, *Handbook to the Cath.*, 8vo., Win., 1854; and *Memorials of Winch.*, 8vo., Win., 1866. *The Roofs and Vaults, etc.*, *BUILDER Journal*, 1876, xxiv, 851. *The Excavations, idem*, 1886, i, 531; 259 of xlix, 13 Feby. GROSS, *The Guild Merchant*, 8vo., 1889. Rev. A. G. L'ESTRANGE, *Royal Winchester*, 8vo., 1889. P. HALL, *Pict. Mon. of Win.*, pl. after Carter and Garbett.

WINCHESTER (ÆTHELWOLD or ETHELWOLD of). He was born about 910 or 920 at Winchester, and with S. Dunstan, archbishop of Canterbury, and S. Oswald, archbishop of York, established under king Edgar and his predecessors about fifty monasteries of the Benedictine Order. He became bishop of Winchester 963-84. About 948 or 954 he restored the monastery at Abingdon, formed a canal for supply of water to it, presented many rich articles the work of his own hands, including a silver altar-table, and two bells; and it became under him the nursery of the king's foundations; restored Chertsey and Ely monasteries; reformed and rebuilt Winchester cathedral finished 980, wherein the west crypts are attributed to him, the abbey of nuns there, Hyde abbey near it, canals formed for supply of water, and built S. Swithun's chapel; also rebuilt many religious houses destroyed by the Northmen, including 966-70 the monastery at Medeshamstede afterwards Burgh and now Peterborough; in the king's charter for it occurs the passages "quarum ipse infatigabilis constructor"; and "hic Dei sapiens architectus magno zelo domus Dei studuit reparare". HYDE CLARKE, *Life*, in CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 376, with references. Work at Peterborough, ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1855, p. 190-1. He died 1 August 984 at Beddington in Surrey, and was buried in Winchester cathedral.

WINCHESTER (ELPHEGE of), 984-1006 bishop of Winchester, is considered by LINGARD, *Ant. of the Anglo-Saxon Church*, 2nd edit., 1810, p. 414, to have built the west crypts, which are usually attributed to his predecessor Æthelwold, also said to be by Walkelin. He was killed 1013 by the Danes at Greenwich, Kent.

WINCHESTER. See PAULET (JOHN), fifth marquis of Winchester.

WINCHESTER (WILLIAM), 1363-6, mason and "apparator operantium", under Henry de Yveley, at Westminster palace; BRITTON AND BRAYLEY, *Palace of Westm.*, 8vo., 1836, p. 196.

WIND; PRESSURE OF; relating to building. "With regard to the phenomenon called 'a gust of wind' nothing is known either as to its cause, or as to its exceptional but almost momentary velocity, or as to the extent of the area over which it temporarily operates; but it is, notwithstanding, certain that a wind-pressure of even 40 lbs. on the square foot is unknown in these islands, because, as may be readily shown, this intensity of pressure would have sufficed to overthrow most of the long-existing factory chimneys, to overset post windmills, and to scatter the greater number of the slighter-built domestic and other structures which have nevertheless 'weathered many a storm', and still remain intact." The above extract is taken from a paper by the late sir Thomas Hawksley, F.R.S., on the *Pressure of Wind upon a Fixed Plane Surface*, presented to the British Association for the Advancement of Science and printed in their *Report* for the year 1881. It serves to show how very inexact is our knowledge of the subject, and how largely the safety of many structures must depend on the accident of their being built in sheltered situations. The pressure exerted of

course depends on the velocity of the wind, and in the paper above referred to, the following velocity is given:—

| Vel. in ft. per sec | Vel. in miles per hour. | Pressure in lbs per sq ft |
|---------------------|-------------------------|---------------------------|
| 10 | 6.8 | 0.25 |
| 20 | 13.6 | 1.00 |
| 30 | 20.4 | 2.25 |
| 40 | 27.2 | 4.00 |
| 50 | 34.0 | 6.25 |
| 60 | 40.8 | 9.00 |
| 70 | 47.6 | 12.25 |
| 80 | 54.4 | 16.00 |
| 90 | 61.2 | 20.25 |
| 100 | 68.0 | 25.00 |
| 110 | 74.8 | 30.25 |
| 120 | 81.6 | 36.00 |
| 130 | 88.4 | 42.25 |
| 140 | 95.2 | 49.00 |
| 150 | 102.0 | 56.25 |

which agrees fairly with Smeaton's much older table given in this work s. v. Aerodynamics; other tables somewhat differing, of Dr. Rouse and Dr. Lind compared with observations by col. Beaufoy, are given in TREDGOLD, *Cast Iron*, 8vo., 1824, p. 285. FORCE OF THE WIND. HURRICANE.

The pressure is however also measured directly at various observatories on small pressure-plates, though it is open to question whether it is altogether reasonable to apply results so obtained directly to large areas, some who have investigated the matter holding "that the wind-pressure per square unit increases with the size of the surface"; BENDER, *Structures to resist Wind*, in INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, lxi, 83; but the rate of increase must at any rate be very small, professor sir George Stokes, when under examination at the Tay Bridge inquiry, stating that pressure was nearly proportional to area of surface. In the BRITISH ASSOCIATION *Report* for the year 1882 it is recorded that pressure of 80 or even 90 lbs. per sq. ft. had been observed in extremely exposed positions such as the Bidstone Observatory near Liverpool, corresponding to a velocity of from 120 to 130 miles per hour. During a fierce gale on 10th Feb. 1881 the force of the wind recorded on the observatory at Greenwich was 26 lbs. to the square foot, corresponding to a velocity of about 70 miles an hour, while on the same date the velocity was measured at an observatory in Surrey at 1,150 miles in 24 hours, *BUILDER Journal*, 1881, xl, 207; or a mean of 48 miles per hour, so that there may well have been a maximum increase of 50 per cent. for a period the actual duration of which must be a matter of uncertainty. Mr. R. H. Scott, in *Quarterly Journal* of the METEOROLOGICAL SOCIETY, 1874, ii, 109, estimates the velocity of wind in the greatest hurricane at 90 miles an hour, and "on the whole it seems probable that the greatest velocity of the air in a cyclone is not much more than double the greatest progression of the storm centre. But this rule also would need modification, because cyclones whose centres describe a curve progress more slowly than those whose path is straight, whilst the whirling motion is increased; and there have been observed whirlwinds (though not many) whose centres were stationary. The greatest progressive motion of an Atlantic hurricane having been observed to be 50 miles per hour, and no change of direction taking place, it may be assumed that the velocity of the wind proper at its maximum was not more, or much more, than 100 miles per hour" (BENDER, p. 85). It is, however, certain from recorded balloon journeys that the velocity at high levels is frequently much greater than at the earth's surface—while therefore the limit imposed by the Board of Trade, of railway structures being designed to withstand a wind pressure of 56 lbs. per sq. ft. uniformly distributed may be necessary in exposed situations, anything like such a provision would be excessive in the case of the majority of buildings, and it is only in special situations and where a great length of wall is unsupported by cross-walls that a possible pressure of even 30 lbs. per sq. ft. need be considered, for many buildings exist and have existed for years which "would become

unsafe with less pressure than 5 lbs. per sq. ft., and must certainly overturn with 12 lbs. per sq. ft."; prof. UNWIN, *On Walls*, in lecture at Carpenters' hall, in *BUILDER Journal*, 29th March 1890, lviii, 229.

Much may frequently be learnt from a failure and no more instructive instance has occurred in recent years than the Templeton mill at Glasgow blown down during construction in Nov. 1889, as described in *BUILDER Journal*, 1st March 1890, lviii, 147. The side walls were 185 feet long and 70 feet high without cross-walls, one (farthest from the wind) not being continued to the ground but resting on cast-iron lintels 2 feet wide supported on H-shaped stanchions. The front wall, on which the force of the wind directly impinged, was on the testimony of all the witnesses examined after the accident, a strong and very well-built wall, 2 feet thick in the lower stories and 18 ins. above; the building was divided longitudinally by girders resting on columns, and the floor joists ran from front to back, some being continuous but the majority running from front wall to girder and from girder to back wall. Failure took place by "the simultaneous collapse of both front and back walls", the base plates of several of the H-stanchions being broken. The immediate cause of the accident seems therefore to have been the tilting outwards of the range of stiffs on which the back wall was built, but the commissioners appointed to inquire into the cause of the disaster report, "it is probable that if the roof, floors, and windows of the building had been completed, no wind-pressure which has been observed in this country would have been sufficient to destroy it"—the obvious lesson being that it is not merely the stability of the completed building that ought to be considered, but that the conditions which may prevail during its erection have also to be reckoned with. T. H. K.

WIND BALK. In 1532 timber at Durham was sawn [out of winding] into "wynd balks" with other named timbers; SURTEES SOCIETY, *Finchale Priory*, 8vo., Newe, 1837, p. 445. 1. 17. 19.

WIND-BEAM, strut-beam, collar-beam, and top-beam are terms given to the usual "collar-beam" of a roof parallel to the tie-beam, in MOXON, *Mechanick Exercises* (Carpentry), 4to., 1693, p. 143, pl. xi. **WIND BALK** may be another term for it.

WIND BRACE. An old term and still used for a raking timber to sustain a roof against the impact of wind, fixed at right angles to the line of tiebeam or collar connecting them to the ridge or purlins, or fixed diagonally from wall plate to ridge following the rafter's plane. MORRIS, *Brief Chapters on British Carpentry*, in *BUILDING News Journal*, 1870, xviii, *passim*. R. R. K.

WIND GUARD. - Another name for the cowl or other invention to cure a smoky chimney being fixed at the top of the flue; or to create a draught up a flue, or prevent a down draught.

WIND SKEW. The term in Scotland for a machine that can be altered according to the change of wind, to prevent a smoky chimney.

WIND and AIR SLAKED. Blue lias lime, called Bath brown lime in the locality of Bath, is after burning, placed in roofed sheds open at the sides allowing the atmosphere to act upon it; GWILT, *Encycl. of Arch.*, edit. 1867, § 1843a. **SLAKED LIME.** Air-slaking of PORTLAND CEMENT so as to effect the hydration of the lime, is described *s. v.*

WINDE (CAPTAIN WILLIAM), also Wynne, a native of Bergen op Zoom; a pupil of sir B. Gerbier; is said to have designed Powis house, No. 66, Lincoln's inn fields, afterwards Newcastle house; the house at Cliefden, Buckinghamshire, for the second duke of Buckingham; burnt 1795; after 1667-95 Coombe abbey, Warwickshire, for lord Craven, burnt 1718 (*BUILDER Journal*, 1846, iv, 5, 7); also Hempstead Marshall, Berkshire, for the same nobleman, begun 1662 by his master (died 1667); a new front 1675 built by T. Strong, and being burnt 1718 was commenced rebuilding after a design by J. Gibbs; KIP, *Nouveau Théâtre de la Grande Bretagne*, fol. 1708, pl. 45; and

Britt. Illustrata, fol., 1720, pl. 45. 1703-5 he designed Buckingham house, S. James's park, for John Sheffield, marquis of Normanby and duke of Buckinghamshire, who pulled down the previous Arlington house. It is the nucleus of the present Buckingham palace. CAMPBELL, *Vitruvius Brit.*, fol., 1715, i, pl. 43. WHEATLEY, *London, Past and Present*, 8vo., 1891, p. 291-3. He had a 20s. mourning ring at the funeral 1703 of S. Pepys. Several of the father's designs were sold at the son's sale of prints and drawings in 1741; WALPOLE, *Anecdotes*. 1.

WINDENMAEKER (NICOLAS), 1552 master of the works at Strassburg, succeeded Michel de Zeitz. His seal with the date of 1539 is given in LANCE, *Dict. des Arch. Français*, 8vo., Paris, 1872, i, 340.

WINDER. Called "wheeling step" in Scotland. The step or steps formed in the otherwise HALF-FACE of a STAIRCASE, usually to obtain headway under that portion. It should never be used in a public staircase. WINDING STAIR. 1.

WINDFORD (WILLIAM). See WYNFORD (W.).

WINDHARD of S. Gall. See WINIHARTUS.

WINDING. The curious "drawing" inwards of a long wall, as in S. George's hall, Liverpool, referred to by RAWLINSON, *Masonry Construction*, read at LIVERPOOL ARCHIT. SOCIETY, in *BUILDER Journal*, 1858, xvi, 103. **CASTING. OUT OF WINDING. WARPING.**

WINDING PLANE. See CORDONATA. **SPIRAL SLOPE.** Still adjoining the north transept of the *dom* at Regensburg, is the temporary *eselsturm* or ass's tower for the conveyance of building materials up a winding inclined plane. An illustration of a plane is given in VIOLETT-LE-DUC, *Dict. Rais.*, s. v. échafaud, v, 106; and in stained glass in south aisle of the nave of Ely cathedral, representing the building of the tower of Babel.

WINDING STAIR. A staircase, a turret stair, formed of all winders. **CIRCULAR WINDING STAIR; Cocklea; TURNGRECE; TURNPIKE STAIR; Vis or vice; newel stair; GEOMETRIC STAIRS.** In the Belvedere, in the Vatican, is a winding stair constructed between columns, which is graduated in such a manner that it can be ascended on horseback: in this work the Doric order is followed by the Ionic, and the Ionic by the Corinthian—the invention of this stair by Bramante was borrowed by him from S. Niccolo of Pisa; it is behind the fountain of Cleopatra, in a part now abandoned, and is therefore altogether useless; VASARI, *Lives*, 8vo., edit. 1851, ii, 435.

The *frauenhaus* or maison de Notre Dame 1581 at Strassburg has a good winding staircase.

WINDMILL (Lat. *molendinum ventriticum*, 1308; Fr. *moulin*; Ger. *windmühle*). A machine for grinding or pumping, and worked by the wind; supposed to have been first invented in the dry country of Asia Minor. A Saxon (?) mill still exists near Guy's cliff, Warwick; it was used in Normandy as early as 1105. HALLAM considers it was introduced by the Netherlands; GIBBON, *Decline*, etc., 8vo., edit. 1855, vii, 36. 13 Edward I; 1285 a grant to the prior of S. Katherine at Lincoln to erect a windmill, *unum molendinum ventriticum*, at the entrance to the priory. Introduced into England from Palestine after the first crusade, where they were invented to supply the deficiency of water; FORSYTH, *Antiquary's Portfolio*, 8vo., 12mo., 1825, i, 72. DELISLE, *Origin of Windmills in Normandy and England*, in *Journal of the ARCHAEOLOGICAL ASSOCIATION*, 8vo., 1851, vi, 403. TAYLOR ET NODIER, *Voyages Pitt.* (Languedoc), fol., Paris, 1833-42, ii, p. 107. STRUTT, *Ant. of England*, v, p. 282. A mill designed by I. Jones at Chesterton, Warwickshire, is given in *BUILDER Journal*, 1843, i, 255; ii, 96; and *CIVIL ENGINEER, ETC., Journal*, 1843, vi, 298. PENNY MAGAZINE, 1836, v, 480. Windmills were constructed almost exactly as at present in XIV cent., TURNER AND PARKER, *Dom. Arch.*, 8vo., Oxford, 1853, ii, 151, giving a cut from a MS. in Bodleian library, No. 364, HOFFMANN, *Windmühle*, 6 pl. *Entwässerungen* in Holland, in *ALLGEMEINE BAUZEITUNG*, 1854, pl. 667. A windmill removed sixteen miles from Westacre to Clenchwarton,

Norfolk, described in *BUILDING NEWS Journal*, 1870, xviii, 460. No windmill can be erected within fifty yards of any carriage-way without being enclosed and concealed from the road, under a penalty of £5 per day during its continuance.

A "Post windmill" has the whole mill elevated some 10 feet from the ground, revolving upon a strongly braced oak post: a "Smock windmill" is of brick or stone circular on plan with battering wall, the head revolves automatically by the wind actuating a tail fan so set that the sails always face the wind. Patent sails are formed of a series of slats on pivots balanced by a weight in the mill roof, and so adjusted that they close if wind is slight, and open if it come in furious gusts: they were patented in 1807 by sir W. Cubitt, C.E. A mill at Haverhill is on the same slatted principle, but with circular sails, and works evenly.

R. R. R.

WINDOW (Lat. *fenestra*; Sp. *ventana*; Fr. *fenêtre*; Ger. *fenster*). An aperture or opening in the wall of a building for the admission of light and air to the interior. A good account of the various forms historically is given in PENNY CYCLOPEDIA, 1843, which here need not be taken up. The following are some of the early names given to the opening: *fenestra*, a window; *lucanar*, day of a window; *superliminare*, a lanterne or light from above; from a xv cent. Vocabulary; another one (p. 203) gives *spelare*, a window; MAYER, *Vocabularies*, edited by T. Wright, 8vo., 1857, i. 1567, "one playn wyndow of stone of sex monyells and betwyxt every monyell one fote wi the playne traunsill barre of stone in the mydest—", HUNTER, *South Yorkshire*, fol., London, 1828-31, ii, 278. The inventory of goods, etc., in Brooke house, Hackney, written about the time of James I or soon after, when it was occupied by the countess of Oxford, or vested in the crown, gives a variety of names; ROBINSON, *Hackney*, 8vo., 1842, i, 110-4, from Ayscough's Cat. in Brit. Mus., No. 103.

Reflections upon Windows, by H. N. Humphreys, in LOUDON, *Architectural Mag.*, 8vo., 1838, v, 648-58. *Early Windows in Monasteries*, in DALY, *Revue Générale*, 4to., 1840, i, 586; and 1852, x, 13-9. *Early English Lancets*, in ECCLESIOLOGICAL JOURNAL, 1844, iii, 65-72; with sizes of lancets and triplets. BRANDON, *Analysis*, 4to., 1847; with other publications, s. v. Tracery. RICKMAN, *Attempt*, 8vo., Oxford, 1848, 5th edit. *Casements and Ventilation*, in BUILDER JOURNAL, 1856, xiv, 657. RIDGE, *Street Architecture—Windows*, idem, 1861, Nov. (and reprinted in DUBLIN BUILDER JOURNAL, 1861, iii, 694). *The Window*, idem, 1864, xx, 804, 839; 1877, xxxv, 1059, by S. Huggins. WEBB, *Windows and their Treatment*, in BUILDING NEWS JOURNAL, 1878, xxxv, 555. *Renaissance Windows*, from 1589-, in WILLIS AND CLARK, *Arch. Hist. of Cambridge*, 4to., 1886, iii, 552-9.

BAY. BELFRY. BOW BAY. BLIND. BULL'S-EYE. CASEMENT. CLEANSTORY. CORONET. ESPAGNOLETTE. FALSE. FENESTRAL. FENESTRATION. FOIL. FORMPEYS. FRENCH. FRENCH CASEMENT. GABLE. GEOMETRIC. GLASS (p. 45a). HIT AND MISS. HOOD. HYPETHRI LUMEN. JESSE. LANCET. LANTERN. LOWSIDE. LOOP. MARIGOLD. MEMORIAL. ORB or blind. ORIEL. OX-EYE. PALLADIAN. PEDE. PIERCED WORK. ROUND or ROSE. SACRISTAN. SASH. SEGMENTAL-HEADED. SKYLIGHT. SLITT. TOWER LIGHT. TRACERY. TRANSOM. TRELLIS. TUDOR. VENETIAN. WATER-TIGHT. WHEEL and Catherine wheel. WYATT.

Illustrations, pt. 1, 1851-2, No. 298; Circular, pt. 3, 1850-1, No. 249; Coronet, pt. 2, 1848-9, No. 250; Balcony, pt. 1, 1854-5, No. 20 or 12.

WINDOW OF WROUGHT IRON. This is supplied to form a casement opening in a larger light, as a "lattice". It is ordinarily impossible to prevent a sharp current of air entering at the joints, and sometimes wet also: hence the numerous patents. It is usually prepared for setting in stone jambs and mullions. Smith's patent weather-tight casement fastenings for French windows. Smith's patent weather-tight WATER BAR. 1864 David Moline patent wrought-iron windows, stronger than cast iron, manufactured by H. Rogers and Co., the General Iron Foundry Co. 1864 Burt and Potts' patent wrought-iron

water-tight window and frame. J. H. Johnson, patent wrought-iron casements; BUILDER JOURNAL, 1863, xxi, 731. Harris's patent wrought-iron windows, by Whenman and Co. Edwin Goddard's improved wrought-iron weather-tight casements and frames for wood or stone mullions. Williams and Co., new steel "climax" casement. Hartig's patent air-tight and noiseless window.

WINDOW APRON. The lower part of the outside of an oriel above the corbelling, is a suggested term. Also a sheet of lead resting on the tiles or other cover of a roof, dressed up to the lower part of a dormer window and turned up inside for the sill to rest upon.

WINDOW BACK, or back of a window, called "bunkar lining" in a Scotch specification of 1754. A piece of wood framing filling up any space between the bottom of a sash frame and the floor of an apartment; it is generally described as consisting of one panel, but is often made of more than one, where the sill of the window is wide, or high up from the floor. When the sash is not flush with the inside of the wall the recess or the back is bounded by the sides or elbows. When there is a window seat, the back, which is then in a line with the inside of the wall, is either panelled or the papering is continued along it.

WINDOW BAR. The bar inserted in a window to hold or separate the squares of glass. It is usually of wood, BAR and SASH BAR, but MANDAR, *Etudes d'Architecture*, fol., 1826, pl. 116, shows "petit bois en tôle", and "petits bois en fer blanc" (tinned iron) to the lights of a *serre* or hothouse. Shop-fronts have bars or frames of brass, moulded as desired; and the patent crystal window bar by Lloyd and Summerfield of Birmingham, are adapted for domestic windows, shop-fronts, conservatories, skylights, verandahs, exhibition and counter cases, aquariums, fern cases, etc., combining perfect transmission of light, durability against rust or decay, and economy in the facility with which they are kept clean. GLAZING, for the various arrangements of bars or rafters for skylights.

1.

WINDOW BOARD. "Washing board" in a Scotch specification of 1754.

WINDOW CASE. A window frame cased for hung sashes; a term used in Scotland.

WINDOW FASTENER. SASH FASTENER for ordinary windows; and ESPAGNOLETTE for a French casement; Padmore's double-action casement fastener, top, and bottom at same time; Gibbons' Victoria patent sash fastener.

WINDOW FRAME or SASH FRAME. The framework of timber formed to receive the casement, or sashes, as the case may be. The old method of fixing the frame in a brick wall and in a timber house is explained in MOXON, *Mechanick Exercises*, 4to., 1679, p. 148; and 1694, p. 144. CHAMBRANLE. Woodcut, s. v. Box of a shutter.

1.

WINDOW GLASS. See Glass (45a); and CROWN, PLATE, and SHEET; also GROUND GLASS.

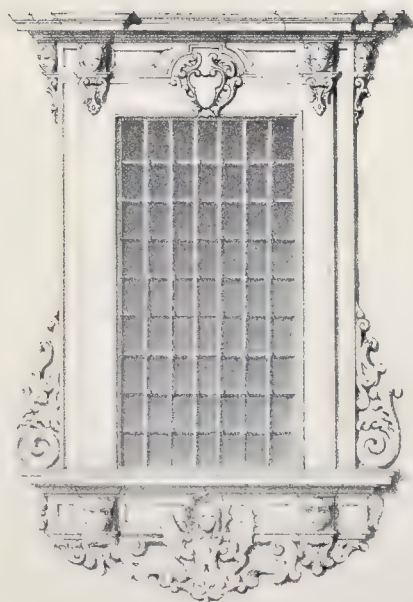
WINDOW GLAZING. Thin parchment stretched on a frame and afterwards painted and varnished; parchment painted and coated with linseed oil to make it transparent; and linen painted and coated with white of egg and gum water and varnished, are described in a Bolognese MS., 214, 215, 216 (i, lxxx). Paper was used in France at close of XVII cent., and the person to fix it was called *chassissier*, and he who repaired or cleaned the glazed window on the inside of the apartments of the palace, left the *chassissier* the care of renewing the double windows of paper, there apparently being two frames one of paper the other glazed. The paper was soaked with poppy oil, mutton suet, or wax; and being exposed to the weather were found more expensive than glass, which was perhaps a cause of their falling into disuse. Such windows may still be seen in many villages in the north of Italy; LE VIEIL, *Peinture sur Verre*, fol., Paris, 1774, 235; quoted in MERRIFIELD, *Art of Painting*, 8vo., 1849, i, lxxxi. *Venians* or glazed frames to windows; RAY, *Itinerary*, 1661, states that he

WINDOW

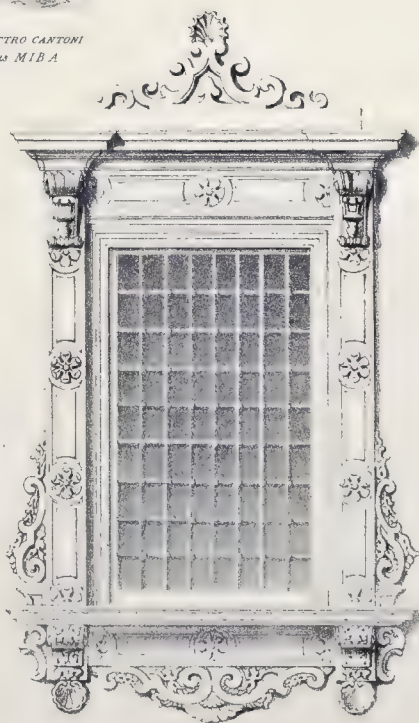


BENEDICTINE CONVENT

STADIA DEGLI QUATTRO CANTONI
1 H Lens MIBA



STADIA DEGLI QUATTRO CANTONI



CATANIA

STADIA DEGLI QUATTRO CANTONI



WINDOW

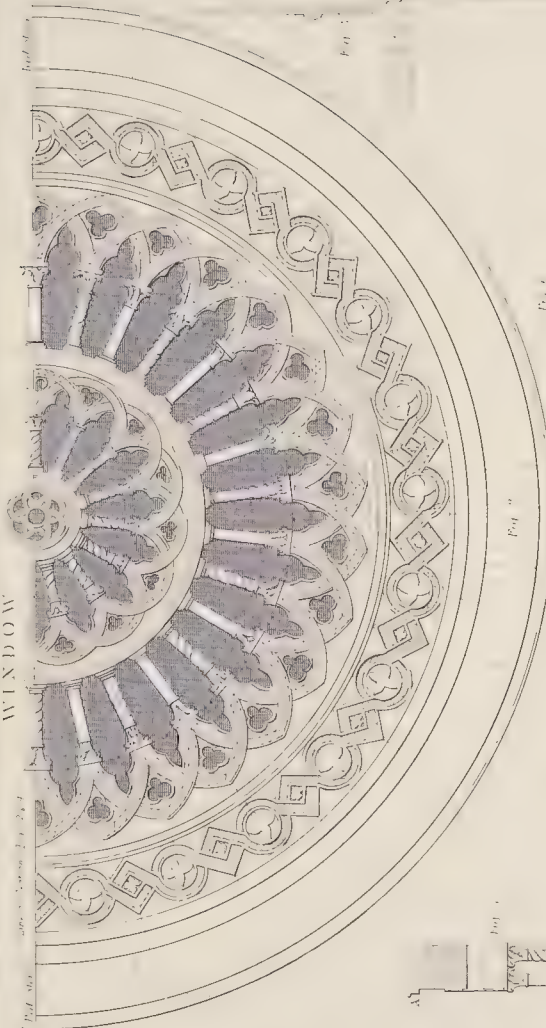


Fig. 1

SANTA CECILIA, VIENNA

Fig. 2

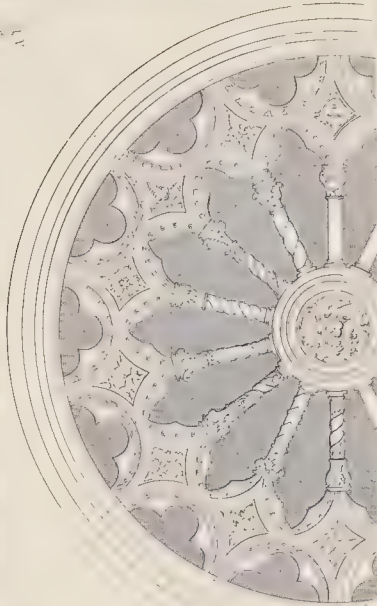


Fig. 3

CATHEDRAL, SPOLETI

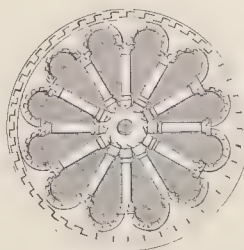


Fig. 4

CATHEDRAL, SPOLETI

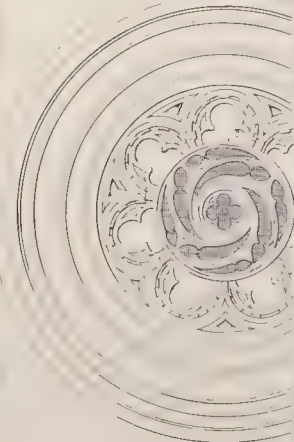


Fig. 5

CATHEDRAL, SPOLETI

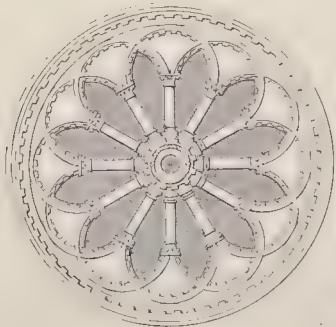
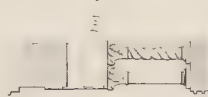
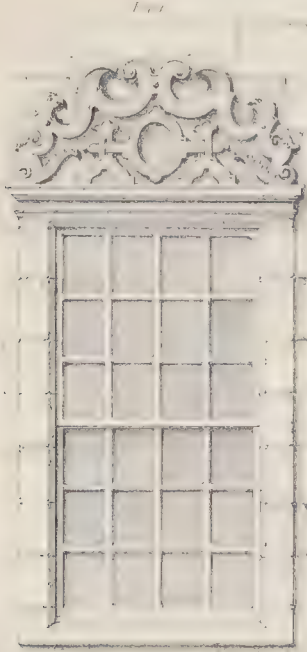


Fig. 6





WINDOW CORONETS



W. GILBERT GLASGOW



James Wyllie Glasgow



found only the upper part of the window even in the royal palaces in Scotland, glazed, the lower having two wooden shutters; as noticed in CULIUM, *Hist. of Haverstall*, 4to., 1784; 1813, p. 242. The Archaeological Institute, at Winchester, 1845, p. 47 of Notes, adds that the windows of the hall at Ludlow castle present similar features; as well as the hall at Winchester. "Glasen wyndowis let in the lyght and kepe out the winde; paper or lyn clothe straked across with losyngz make fenestrals instede of glasen wyndowes"; HORMANUS, *Valpuria*, 4to., London, 1519, p. 242-4.

In 1505, 21 Henry VII, it was held that though the windows belonged to the heir, the glass was the property of the executors and might therefore be removed by them "quar le meason est perfitte sauns le glasse"; syr Robert BROOKE, *La Grande Abridgement*, fol., London, 1573, s. v. Chateles. Nearly a century afterwards 1599, 41-2 Elizabeth, it was in the Common Pleas "resolved per totam curiam, that glass annexed to windows by nails or in any other manner, could not be removed, for without glass it is no perfect house", and that the heir should have it and not the executors; COKE, *Reports*, part 4, p. 63b, as given in NOTES and QUERIES *Journal*, 1851, iv, 99. The cost of glass at that time from the size and number of the windows was no light one. It may be remarked, that in 1505 very frequently the glass of windows was not then fixed, but consisted of movable casements easily taken out and laid by—. The increasing practice of annexing it to the windows might be an additional reason for the heir to prosecute his claim; TWOPENY, *Notices of Past Times from Law Books*, in BRITISH MAGAZINE, 8vo., 1833, iii, 650. The will of Robert Birkes of Doncaster, alderman, proved at York, July 30, 1590, gives to his son Robert all "the seeling work and portalls" in and about his house, "with all doors, glass windows", etc.; the house he gave to his wife for her life; NOTES and QUERIES *Journal*, 1851, iv, 328. Burt let a house to Haslett, with covenant for tenant at end of lease to yield the premises with all windows, fittings, improvements, etc. Haslett took out a common glass window and put a plate-glass one, not nailed or screwed but wedged up with wood; and at the end of the tenancy removed the plate-glass and replaced the common one. The court held that the plate-glass belonged to the house and should not be removed; Court of Common Pleas, as reported in DAILY NEWS, 23rd April 1856. In an agreement, a memorandum should be made of broken windows, as a tenant is obliged to leave them whole, although he may not have found them so.

Glass may be fixed in a stone window frame or mullion by using a mixture of Bath stone-dust and linseed oil made up similarly to putty. Its elasticity will allow of any slight settlement in new work. It is more waterproof than Portland cement, as it is not so liable to crack, and the latter without a large proportion of sand will almost invariably burst glass; and it is liable to turn the colour of freestone, Corsham Down more especially; BUILDER *Journal*, 1864, p. 796; BUILDING NEWS *Journal*, 1869, xvi, 45. Plate-glass can be set in stone in a bed of mastic; or the top and sides in ordinary oil putty. Pasting slips of paper over shop and house windows, is considered a guarantee against damage by vibration from a bombardment; and it is often done in packing glazed pictures for transmission.

WINDOW GUARD. A small balcony, or balconet, or a GRATE outside the lower windows of a residence; TURNER and PARKER, *Dom. Arch.*, 8vo., Oxford, 1853, ii, 105. A cast-iron "frame" or grille, 20 ft. high by 8 ft. wide, weighing five tons, was manufactured at Belfast for the palace of the pacha of Egypt, and is engraved in ILLUSTRATED LONDON NEWS, 1848, xiii, 396.

WINDOW LEAD. See CAME; and LEAD for glasswork.

WINDOW LEDGE. See LEDGE of a window.

WINDOW LIGHT. A phrase used in contradistinction to the light obtained through a glazed door, fan light, fixed, or skylight, or any other such means of illumination. SKYLIGHT. View.

ARCH. PUB. SOC.

Since the articles, AIR, LIGHT AND AIR, EASEMENT, etc., were printed much litigation has occurred and many publications been issued, on this subject. WOOLRYCH, *Law of W. Lights*, 12mo., 1864. LATHAM, *Law of W. Lights*, 8vo., 1867; of the importance of the subject, more especially to citizens, whose right to window lights, in consequence of circumscribed space, becomes more and more valuable almost every day, the nature of the right to window lights, its origin and extent, loss of the right, remedies, and other matters affecting the subject, are alike ably treated; large numbers of cases are quoted, and, in an appendix, some conveyancing forms are given. WEBB, *Law of Easements*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, Dec. 1877, and Jan. 1878: Report of Committee 27 July 1882, and 22 March 1883: KERR, *Ancient Lights, and Evidence of Architects*, idem, S. P., 1866; and *Evidence of Surveyors, etc.*, 8vo., 1865: TARN, *Admeasurement of Sky in cases of Lights*, S. P., 1870; and WHITE, *Measurement of Obstruction of Light*, S. P., 1866. ROUND, *Right to Light and Air*, 12mo., 1868. ROSCOE, *Digest of Cases on the Law of Light*, 1881; 1886. FLETCHER, *Light and Air*, 8vo., 1879. COX, *Law and Science of Ancient Lights*, 8vo., 1869. HOLDEN, *Easements and Rights of Light*, 8vo., Manchester, 1885. "Yates v. Jack", *Bill of Complaint*, etc., fol., 1865-6. GOSTLING, *Measurement of Ancient Lights*, 1889. GARDINER, *Points in the Law relating to Ancient Lights*, SURVEYORS' INSTITUTION, *Transactions*, 1888, xx, 219-310: also *Professional Notes*, iii, 110 and 383. "Burrow v. Ross", Birmingham Assizes, turns on the Artizans' and Labourers' Dwellings Act 1875, 38-9 Victoria, c. 36; in "Times" of August 12, 1880. PARIS, *Kritik der herrschenden Lehre vom Licht und Fensterrecht*, 8vo., Berlin, 1879. WASHBURN, *Law of Easements*, Boston, U.S.A.

FERGUSON, *Made in which Light was introduced into Greek Temples*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 18 Nov. 1861; and *The Parthenon*, 4to., 1883. HYPETHRAL.

WINDOW SASH. See SASH.

WINDOW SEAT (Fr. *banc*, in VIOLLET-LE-DUC, *Dict.*). See CARRILL, and other references, s. v. SEAT. An example 1310 from Alnwick castle, Northumberland, and another 1320 from Belsay castle in the same county are given in TURNER and PARKER, *Dom. Arch.*, 8vo., Oxford, 1853, ii, 94.

WINDOW TAX OR DUTY. This was first enacted by William III, 1695, for seven years; increased 1746, 1778, 1784, 1797, 1802, 1804, 1808; reduced 1823; new duties 1825, repealed 24 July 1851, when a moderate "house duty" or "duty on inhabited houses" was substituted. "1710 was all day attending workmen, making up windows, to prevent the extremity of an unequal tax, that would else equal me in payment with the greatest nobleman"; THORESBY, *Diary*, 1674-1724, 8vo., 1830, ii, 59.

WINDOW TRACERY. See PLATE TRACERY, and TRACERY.

WINDRUSH STONE. See BURFORD STONE.

WINDS, Temple to the. See ATHENS. The HOROLOGIUM, or octagon tower of Andronicus Cyrrhestes. The capitals from the villa of Lucius Verus at Rome are undoubtedly the works of Greek sculptors; one is the counterpart of some at Patras, and resembles those of the temple of the Winds; PARKER, *Arch. of Rome*, Construction of Walls, 8vo., Oxford, 1874, "On details of Roman Arch.", by Pullan, i, 69, chap. 3; photos. 1497 and 1502. The four winds carved in a capital at Venice, in the corridor over the Fig-tree angle of the Ducal palace; RUSKIN, *Stones of Venice*, 8vo., 2nd edit., 1867, ii, 367.

WINDSOR BRICK. A fire-brick. These bricks were made at Gerrard's Cross and carried to Windsor to be sent by water to London where they were sold at Fleet ditch side in 1747-50; chiefly used for furnaces and potters' kilns as being the best for standing great heats. LANGLEY, *Builder's Prices*, 8vo., 1750, p. 14. It was also called HEDGERLEY BRICK. WELSH LUMP. 4.

WINDSOR CASTLE. This palace, the residence of the monarchs of Great Britain and Ireland, is situated in Berkshire, and holds a very high rank among the palaces of Europe; it is far superior to many in point of situation, especially so in antiquity. The castle consists of the Lower and Upper Wards

having the "Round tower" between them. It is 1,480 ft. long from east to west, and contains 12 acres, 2 roods, 30 poles, exclusive of the terraces. Edward the confessor resided at Old Wyndlesore, and granted the site of the town and castle, possibly built by earl Harold, to the abbey of S. Peter at Westminster. William I exchanged lands in Essex and elsewhere to regain this property. Henry I probably added largely to the buildings as some fragments of stone of this period have been found; he is said to have erected a chapel dedicated to Edward the confessor, and in the treaty of peace with Stephen it is coupled with the Tower of London under the designation of "mota de Windsor". Henry II built the outer wall of the south front of upper ward, and is the first name that occurs in the Pipe Rolls. By Henry III the whole of the lower ward was built, of which the Clewer or Curfew tower remains almost unaltered, as a prison; as also the king's hall near the chapter library; fragments of the kings' and queens' chambers were found July 1859 north of the chapel, and the north wall of the primitive chapel. Edward I often resided there, and II occasionally; in 1295 occurred a large fire (Stow). Edward III born there in 1312 added to it, built the Round tower, and finished the chapel. After his 13th year (1339-40) a new hall with suite of apartments in upper ward, were built (of which the series of vaults under the royal apartments (Star building) forming ceilings to servants' hall and other rooms are still perfect); he spent £5,658 in six years, perhaps equal to £120,000. Richard II continued the works. PARKER, in *BUILDER Journal*, 1866, xxiv, 557, gives a good résumé up to this period. Edward IV, 15th year 1475-6, built the eastern portion of the new chapel of S. George. Henry VII added the western part and transept chapels; the choir was vaulted; and the small building added between the library and Star building, and he prepared a mausoleum on site of Henry III's chapel. Henry VIII rebuilt the principal gate of entrance from the town; and the chapel works were continued. Edward VI and Mary brought a supply of water from Blackmore park near Winkfield, five miles distant. Elizabeth formed the terrace on the north side, and 1576 added the gallery or library under H. Hawthorne, west of Henry VII's building. Charles II made a series of alterations; erected the "Star" or Stuart or main building, modernised windows, thoroughly repaired the castle; and formed 1676 the terraces on the east and south sides, making the three 1,870 feet in total length; and formed the "Long walk" three miles long by 140 feet wide. William III and Anne planted avenues of elms and beeches in the park, enclosed the little park with a wall; and the queen added the steps from the east terrace into the flower-gardens, expending nearly £40,000. LANGLEY, *Plans and Elevations*, fol. 5 pl., 1743, shows the state of the castle in the middle of the reign of George II. George III chiefly resided here; he restored the north front of the upper ward under James Wyatt; 1787-90 repaired the chapel with other improvements under H. Emlyn; built 1778-82 the queen's lodge, a separate edifice for the occupation of the royal family, at a cost of £44,000 under sir W. Chambers. George IV 1823 demolished this lodge and began the extensive alterations in the upper ward under Jef. Wyatt, afterwards sir J. Wyattville; £300,000 voted and about £900,000 spent; the Round tower was added to in height; and new entrance made opposite the Long walk; the works were carried on during William IV and the early part of Victoria's reign, exceeding one-and-a-half million sterling. In 1840 a grant was made of £70,000 for new stables about 400 feet from the castle, 600 feet long, with a riding-house 200 feet by 60 feet, under sir J. Wyattville which on his death were carried out by H. Ashton. Report from the Select Committee on the expense of completing the alterations and improvements, 1830, and *Second Report*, 1831. *Correspondence respecting Water-supply*, 1849. 1862, the sanitary condition of the castle was reported upon by R. Rawlinson; *BUILDER Journal*, 1863, xxi, 41, 75; and 1872, xxx, 711, 892, 912. The later works are mentioned in the following details of the castle.

The Lower Ward.—1. Winchester tower at end of north terrace, built temp. William of Wykeham, was the residence of sir J. Wyatville. 2. Store tower or wardrobe near the deanery, formerly guard chamber for the military on duty. 3. Julius Caesar's or Curfew tower having eight bells 1863 restored with lofty roof by A. Salvin. 4. Garter tower. 5. Salisbury tower, the residence of the bishop as chancellor of the order of the garter. 6. Entrance tower and guardroom by Henry VIII. In 1862 new guardroom between 4 and 5, 124 ft. long, the chamber 74 ft. by 20 ft. with museum over, under A. Salvin (*B. J.*, xx, 302, 607). In this ward is *S. George's chapel*. At the east end was the primitive chapel of which the north wall remains, the galilee being the east end of the present chapel, the doorways to it are of Henry III and Edward I time, completed by Edward III, and it formed the lady chapel when the present chapel was built. Enlarged by Edward IV and Henry VII; the vaulting of the choir 1506-8 built by J. Hylmer and W. Vertue, freemasons, for £700; the vaulting of centre and western part was built at the expense of the knights companions, 8th Henry VIII. The interior was completely repaired at the expense of George III; also restored and embellished 1843, and bosses painted; *C. E. J.*, vi, 357. The painted glass of west and other windows designed by B. West, P.R.A., executed 1792-6 by Forest, and rebuilt 1842 under E. Blore and restored by Willement, with fourteen others filled with coats of arms (*C. E. J.*, 1843, vi, 357-8; *WEALE, Divers Works of Early Masters*, fol., 1846); the three windows on each side painted over with arms at the same time, were replaced 1841-2 by coloured glass by T. Willement (*C. E. J.*, iv, 326), and the east window 1785-8 by West and Jarvis and Forest was made new 1862 by Clayton and Bell. There are twenty-six oak stalls to which 1814 six others were added; in 1788 the stall of the sovereign was removed and a new seat formed on the right of the entrance to the choir. The old lectern over 6 ft. high was brought to light 1843 by the dean. The altar screen repaired 1787-90 under H. Emlyn; new reredos 1863 by sir G. G. Scott, J. B. Philip, sculptor (*B. J.*, xxi, 189). The tomb of Edward IV of wrought steel is said to be by Q. Matsys of Antwerp (*WYATT, Metal Work*, fol., 1852, pl. 38) but with more justice ascribed to John Tressilian, smith, 1474-82. Above it is the carved oak gallery termed the royal or queen's closet 1576 on which are the arms of Henry VIII and Anne Boleyn. Henry VI is said to be buried 1484 under the arch on south side having his arms carved on the keystone of it. The monument to the duchess of Gloucester 1860 by sir G. G. Scott (*B. J.*, xviii, 232). The chapel is 260 ft. by 65 ft. with transepts 113 ft. long. Down to 1858 the chapel, chantries, and cloisters were restored; the white-wash removed from the stonework and colouring renewed, stall work cleaned; the dean's cloisters restored by ... Cundy, mason, of Grosvenor place; 1878-82 the south-west exterior repaired with pinnacles and turrets, the inside cleaned throughout; 1880 upper portion of west end repaired under A. Y. Nutt, clerk of works to the dean and chapter (*B. J.*, xxxix, 631). TOWNSEND, *Account of a Visitation* in 1552, 4to., 1869. NASH, *Views*, fol., 1805. WILLEMENT, *Account of Restoration*, 4to., 1844. HARRINGTON, *Views of Chapel*, 4to., 1872. BRITTON, *The Chapel*, in *Arch. Antiquities*, 4to., 1807, i. Alterations, *B. J.*, 1872, xxx, 192, 711, 912.

At the east end was the primitive chapel of Henry III and Edward III; adapted by Henry VII for his mausoleum; cardinal Wolsey who obtained it from Henry VIII, had a tomb made for which 4,280 ducats was paid to B. Rovizzano, and £400 for gilding, which was destroyed in the civil wars; James II used it as a chapel; George III, 1811-2 formed a royal cemetery under it, obtaining a vault of same area 70 ft. by 28 ft. and 15 ft. deep. In 1866-75 the building under sir G. G. Scott was restored as the Albert memorial chapel by queen Victoria; the tiled groining filled in with Salvati's mosaic (Oct. 1864), the windows with stained glass, and the walls by designs in marble by baron Marochetti. *The Triqueti marbles, mosaics, and sculptures*, 117 photos., fol., London, 1876. On the north of the chapel are the

residences of the ecclesiastical officers; on south and west those of the poor or military knights. The residences of the minor canons and lay clerks, termed the "horse-shoe cloisters", are at the west end; these cloisters were restored under sir G. G. Scott. Near the north transept is the New Commons 1579 for canon James Denton, where July 1859 were found the portions of the early royal residence. A vaulted passage leads to the great cloisters; and on the north side of it are the inner cloisters inhabited by the prebendaries; while still northward are the "hundred steps" leading down through a postern-gate to Thames street. The deanery, vestry, and treasury, built 24-26 Edward III, 1350-3, adjoin the east end of the chapel, the former rebuilt 1500, and contain spacious living-rooms, and the garter-room or knights' robing-room; a cloister, etc.

The Keep or Round Tower by Edward III stands on a lofty mound, surrounded by a moat, and between the two wards; it is approached by a flight of 100 steps, and contains rooms around an inner square courtyard; it is the residence of the governor or constable. It was raised by Wyatville 30 ft., making it 80 ft. from the top of the mound, or 148 ft. from the quadrangle, or 128 ft. from the road on the west side. A new flag tower begun 12 August 1828, but first stone relaid 16 March 1829, is 25 ft. more; the staff is 73 ft. 1 in. long, 14½ ins. square at bottom, 5 ins. at top. The main tower is 302 ft. 6 ins. circumference, being 102 ft. diameter in the largest and 93 ft. smallest diameter (ASHTON). LANGLEY 1743 gives it 97 ft. diam. outside, 90 ft. inside, and 37 ft. 6 ins. high above its rampart.

The Upper Ward.—The entrance to it is through the Norman towers and gateway, temp. Henry III, opposite king John's tower. *State apartments* 1664-80 are on the north side, forming the "Star" now Stuart buildings by Denham and Wren with additions. Out of the queen's drawing-room doors lead into the Elizabeth library 92 ft. by 13 ft. designed by H. Hawthorne; and Henry VII's building; in 1864 these rooms were remodelled and queen Anne's closet included for a larger library by A. Salvin (B. J., xxii, 168). Among the other noted rooms of state, all renovated or enlarged by sir J. Wyatville, are the Throne-room; the Ball-room 90 ft. by 34 ft. by 33 ft. decorated in style of Louis XIV; Waterloo gallery 98 ft. by 47 ft. by 45 ft., style of Elizabeth, glass in windows replaced 1864; Guard chamber 78 ft. 8 ins. long, 21 ft. wide at one end, 26 ft. at the other, and 31 ft. high with groined ceiling; S. George's hall by Edward III for the knights, was 98 ft. by 22 ft. 8 ins., enlarged to 200 ft. by 34 ft. by 32 ft. high, Gothic ceiling; Queen's presence chamber 49 ft. 3 ins. by 23 ft. 6 ins.; Queen's audience chamber 35 ft. 7 ins. by 23 ft. 8 ins. The *private apartments* and those of the royal household are on the east and south sides of the castle; they were made to communicate by a corridor designed by J. Wyatville, 520 ft. long on the side of the quadrangle; the eastern part is fireproof, of iron girders and brick arches. He also raised the building a story, and lowered the area 6 to 8 ft. At the west end of the ward (in the middle until 1827) is the bronze equestrian statue of Charles II 1679 by Josiah Ibach Strado of Bremen, erected by Tobias Rustal, with carvings by G. Gibbons to the pedestal. Near the Keep at western end of the above range was the "Devil", earl marshal, or Edward III and now maids of honour tower, and near it was the old principal gateway; a new gateway was formed by Wyatville opposite the "Long walk" of the park, with apartments over the arch; York tower refitted to correspond; and a new Lancaster erected 1824; then follow South turret formerly chancellor of exchequer's tower, and Black prince now Victoria at south-east angle. Up the east side are Clarence tower, perhaps the former maids of honour, or king, or board of green cloth; the Chester (formerly library now state drawing-room); and Prince of Wales' at north-east angle. On the north are Brunswick, an octagon of 38 ft. diameter and 100 ft. in height; Cornwall, the ball-room 90 ft. by 32 ft.; George IV's; Powder tower, and the Winchester tower named early in the Lower ward.

Stone used in building the castle 1363-66, 37-39 Edw. III, Wellesford near Sleaford, Helwell, Carey or Cadeby, north of Stamford, Heseleberg, Hessele or Hull, Demelby near Folkingham, and Melton (Ross, westerly of Uleby, near Brigg). To 1483 for the chapel under H. Jennings, stone from Tainton, Oxfordshire, some Caen stone, and Heath stone from Crau-bourne Chase. 1558 some was obtained from "Mr. Gower master of the hardstone quarry in Kent"; and stone by R. Amice from Reading (abbey?) for the fountain. 1. 14.

Names of persons employed on the works; most of them will be found mentioned in this dictionary; it includes the list given in POYNTER, *Essay*, 1841. The dates are those when the name is found first recorded. Extracts from the Pipe rolls temp. Henry III (1216-72) are given in TURNER, *Domestic Architecture*, 8vo., Oxford, 1848; and POYNTER, *Essay*.

| | | | | | |
|---------|---|---|-----------|--|-------------------------|
| 1173 | 5 | Geoffrey, sup. or master builder. | 1171 | 82 | J. Tresilian, m. smith. |
| 1179 | | Osbert, m. of works. | 1474-82 | II. Jennings, m. m. at chapel. | |
| 1225 | | William the clerk, m. of works. | 1471-83 | T. Canecler, c. of w. and comp. | |
| | | John le Draper, do. | | R. Ellis, carver. | |
| | | Thomas, carpenter. | | J. Filles, do. | |
| 1246 | | Nicholas, carp., and Jordan | | Derick van Grove, do. | |
| 1257-40 | | Will. de Burgh, director. | | Giles van Castel, do. | |
| 1210-62 | | William pictor, to paint the cloister; J. Rot, assist. | 1480-99 | E. Seamer or Senerk, warden of masons. | |
| 1260 | | John of Gloucester, m. mason | 1481 | sir R. Bray, sup. (?) | |
| 1242 | | Edward, glazier. | 1482 | John Squier, chief carp. | |
| 1327 | | R. de la Mare, c. of works. | | J. Jenyns | |
| | | R. de Rotheley or Rochelle, supervisor. | 1483 | James Skynke, glazier. | |
| 1311 | | J. Peyntour, sup. and to press workmen. | | John Ogwyer, chief carp. | |
| | | R. de Bernham, sup. | | Ant. Lambeson and other painters. | |
| 1350 | | R. de Rotheley, sup. | 1483-1506 | T. Hunt, c. of w. | |
| | | J. de Spoonlee, m. of the stone hewers. | 1484 | W. Kelly, chief plumber. | |
| | | W. de Harle. | 1498 | R. Nynnes, m. m. | |
| | | W. de Harland. | 1495-9 | sir J. Shaa at chapel. | |
| 1351 | | J. Brocas. | | master Seymour (?) Seamer. | |
| | | O. de Burdeux. | 1499 | R. Jenins, m. m. | |
| | | T. de Foxley, all three to sup. workpeople at the chapel. | 1501-3 | Master Estfeld or Esterfeld, clerk, tomb for Henry VI. | |
| | | R. de Bernham, sup. | 1506-8 | J. Hymler and W. Vertue, m. at vault of choir of chapel. | |
| 1353 | | J. de Alkeshull, prov. | 1502-29 | H. Smyth, c. of w. and comp. | |
| | | W. Palmer, prov. | 1524-9 | Benedetto da Rovezzano on tomb for Wolsey. | |
| 1356 | | W. de Wyckham, sup. | 1530-47 | E. Mascall or Marshall, chief clerk of accounts for all buildings within twenty miles of London. | |
| 1358 | | W. de Mulsho, sup. | 1555 | J. Norys, esq., comp. | |
| 1358-83 | | G. de Carleton, custos of all the mason work and chief m. | 1555 | 8 R. Woodward, c. of w. and for lodgings. | |
| 1359 | | W. de Wyckham, sup. | 1555 | J. Punchardon, serjeant plumber. | |
| 1361 | | John de Ronceby, compt. | | R. Amice or Amys, surv. for fountain and for all the buildings. | |
| 1361-63 | | W. de Mulsho, c. of w. | 1577 | II. M. C. L. paymaster, c. of w. and comp. | |
| 1362 | | W. de Mulsho, canon. | 1579 | L. Seward, surv. | |
| 1364 | | N. Bernard, sup. | 1579-77 | II. Hawthorne, c. of w. | |
| 1366 | | A. de Hertynghon, canon sup. or c. of w. | | J. Hatche. | |
| | | John, canon of S. Katherine's, painter. | | W. Jenins. | |
| | | J. or W. de Lyndesay of London, woodcarver. | 1581-10 | sir J. Norris, comp. | |
| | | W. de Burdon, painter. | | sir J. Trevel, surv. | |
| 1370 | | Prior of Rochester cathedral, John VII. de Hertleye, sup. | 1586 | II. Wickes, pay m. | |
| 1372 | | W. de Wynford, mason, had lands and houses at Windsor and elsewhere, perhaps for work done at the castle. | 1610 | A. Goume, serjeant m. | |
| 1375 | | R. Harresworth, sup. | 1610-25 | W. Sutherst, m. m. | |
| 1382 | | A. Brocas, c. of w. | 1618 | D. Watkins, comp. | |
| 1389 | | G. Chaucer, c. of w. at chapel for 20 months. | 1623 | W. Taylor or Taylour, steward, receiver, father of the mason; and clerk to the constable and sup. of the castle. | |
| 1391 | | J. Geduey, ditto and to receive a livery, 2s. per day. | 1625 | N. Stone, m. m. | |
| 1395 | | II. de Yeveley (?). | 1637 | sir R. Bondet, surv. | |
| 1441-84 | | R. Legot or Legat, chief m. | 1652 | Ingo Jones, Pietra pre-viosly thence. | |
| 1471-81 | | Bishop R. Beuchamp, sup. at chapel. | | | |

- 4660 sir J. Denham, surv.-genl.
sir C. Wren, deputy.
J. Stone, m. m.
E. Marshall, m. m.
1666 E. Jerman, to view.
1668 ... Rowlandson, surv. and
keeper of timberyard.
1669-78 J. Marshall, m. m.
1676 A. Verrio, painter.
G. Gibbons, woodcarver.
1679 W. Chiffinch, paym. (?).
A. Meek, paym.
J. L. Strada, founder of
statue of Charles II.
1681 ... Genaro, painter.
1684 sir C. Wren, surv. gen.
B. May, c. of w.
1701 R. or T. Streeter, painter,
m. of works.
W. Ireland, m. glazier.
A. Fort, m. joiner.
G. Pile, bricklayer.
A. Verrio, painter.
John Clarke, freemason,
chief m.
J. Grove, m. plasterer.
1702 Dom. Pile, bricklayer.
Benj. Culcheth, painter.
1702-15 James Brown, c. of w.
1702 Thos. Fort, joiner.
John Davis, blacks. and
ironm.
David Lance, plasterer.
John Ireland, glazier.
Benj. Jackson, mason.
Henry Bauckes, chief m.
John Ball, sup. and c. of w.
1707 H. Wise, landscape gar-
dener
1710 sir J. Thornhill, painted the
staircase, removed 1800.
1714 Jos. Roberts, esq., plumber.
- 1714-8 T. Rowland, gent., c. of w.
and storekeeper.
1715 Windsor was annexed to
the Board of Works; the ap-
pointments having been pre-
viously made by the governor
or constable of the castle, and
sometimes by the monarch.
1715-29 T. Rowland, c. of w.
1729-35 A. Curtis, c. of w.
1746 W. Kent, painter.
1755 R. Biggs, c. of w.
1778-82 sir W. Chambers, archit.
1787-90 H. Emlyn, rest. of chapel.
1783 T. Tildesley, c. of w.
1795 B. West, desigus glass for
windows.
Jarvis and Forest, painters.
1796 James Wyatt, surv. gen.
1824-40 Jeffrey Wyatt (sir J. Wyat-
ville), surv. genl.
1828 sir Rob. Smirke, c. of w.,
and at other places.
1831 sir R. Westmacott, eque-
strian statue of George III on
Snow hill; repaired by him
1842, May.
1840 Henry Ashton, archit.
Edward Blore, archit.
1858 ... Cundy, rest. of tomb.
1862-5 A. Salvin, archit., rest. of
Curfew and Garter towers.
Guard chamber, the hundred
steps, and part of outer walls.
1866-73 sir G. G. Scott, archit.
186-... John Turnbull, c. of w.
1878 A. Y. Nutt, c. of w. to dean
and chapter at rest. of chapel.
1884-5 J. Lessels, rest. of outer
face of Curfew and Garter
towers, surveyor of H.M.
works.

LANGLEY, *Plan of W. C.*, 5 pl., 4to., 1743. UNIVERSAL
MAGAZINE, *W.* in 1747, i, 53. BICKHAM, *Delicæ Britannicæ*,
Hampton and W., 12mo., 1742. *Les Delicæ de Windsor*, 12mo.,
Eton, edits. 1755 to 1784. POTE, *History and Antiqs. of W. C.*,
4to., Eton, 1749; App. 1762. HAKEWILL, *History of W.*, etc.,
4to., 1813: a *Series of Views*, 4to., 1829. WYATVILLE, POYNTER,
AND ASHTON, *Illustrations of W. C.*, fol., 1841: a full review of
it is in CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 278-80. LEITCH
RITCHIE, *W. C. and its Environs*, 8vo., 2nd edit. by JESSE, 1848.
STOUGHTON, *Notices of W. in the Olden Time*, 1844; and *W.*, etc.,
8vo., 1862. JESSE, *Summer's Day at W. and Eton*, 8vo., 1841.
TIGHE AND DAVIS, *Annals of W.*, 8vo., 1858, 2 vols. WESTALL,
Six Views of W. C. DANIELL, *Views of W. C.*, each 20 ins. by
12 ins. WOODWARD, *Picturesque W. C.*, 30 col. views, 4to., 1870;
(1875). *Les Delicæ des Châteaux royaux*, 12mo., Windsor (1785).
EVANS, *Excursion to W.*, with the improvements, 12mo., 1827.
Royal Windsor Guide, 8vo., edits. 1831 to 1842 and enlarged
1868. PYNE, *W.*, and its Surrounding Scenery, fol. (1839). *The*
Visitor's Companion to the Castle, etc., 32mo., Windsor (1849).
ZEIGLER, *Royal Lodges at W.*, fol., 1839. PYNE, *Royal Residences*,
4to., 1819. BRITTON, *Arch. Illus. by Gandy and David*, fol., 1842.
NASH, *Views of S. George's Hall*, fol., 1805; and *Views int. and*
ext., fol., 1848. WEALE, *Pict. Handbook to London*, 8vo., 1851.
DIXON, *Royal Windsor*, 2 vols., 8vo. (1879). CAMDEN SOCIETY,
Secret Services, 1679-88, 4to., 1851. CARTER, *W. C. illustrated*,
8vo., 1838. MELA BRITANNICUS, *Letter to the Soc. of Dilettanti*
on the works at W., 12mo., 1827. ILLUSTRATED LONDON NEWS,
1846, ix, gives 201 Waterloo gallery and round tower; 237
quadrangle and state ball-room; and 313 Crimson drawing-
room. AINSWORTH, *Windsor Castle*, 8vo., 1843, gives in book
iii a good historical account.

WINE CELLAR. As a rule all large wine cellars are placed
under the level of the ground; it is perhaps best placed towards
the centre of the house to obtain equable temperature—without

artificial heat—but hot water may be applied if desirable—or a
gas jet or two with ventilation, to secure it at times. The tempera-
ture should not exceed 60° Fahr.; it were better as low as 55°;
in either case uniformity is the great desideratum, especially for
light wines. Clarets and wines which have undergone a perfect
fermentation are less affected by cold, and are better in a tem-
perature of no more than 45°;—*BUILDER Journal*, 1846, iv, 525.
Madeira requiring a higher temperature may have a separate
enclosure. The size of cellar is for the owner to decide. For
a small residence a single cellar is now sufficient to meet all
demands. For large households there may be placed, next the
outside, a receiving cellar or space for casks, unpacking, bottling,
washing, hampers, etc.; which may have a window for light, and
an access with flap from without of a size to admit a pipe of wine.
Sometimes a wine-in-wood cellar has also to be provided.
Racks for bottles may be placed either in the packing-cellar or
in the outer air (if required for use or exchange); if the latter
the racks should have locked doors. The cellar should be
placed for easy access by the butler from his pantry, and also
by the master, and to be in some degree apart from general
traffic. Light should not be admitted in regard of temperature,
but any required communication with the exterior should be
through another cellar as above stated. The doors ought to be
strong with good locks; the floor paved, and the ceiling arched
or of fireproof construction. A butler's cellar is sometimes
obtained, and perhaps on the ground level, wherein is to be
kept the small supply in his charge given out by the master.
Also a closet for wine in decanter; another for soda-water, and
other similar liquids. KERR, *Gentleman's House*, 8vo., 1871, 3rd
edit., 243.

Wine-bin.—An enclosure, a small wine-cellar, for storing wine
in bottle. It is made of wood, brick, stone, or slate (best), iron
is now much preferred. A shelf of York flag for a double tier
should be 3 ins. thick to take the weight. A slate shelf about 1½ in.
An ordinary English quart wine or ale bottle is 11½ ins. long
and from 3¼ to 3½ ins. in diameter. When placed neck to neck,
the length is 1 ft. 4 ins., and is called a "double tier". A
bin of one tier for a dozen bottles side by side must be at least
3 ft. 5½ ins. wide and 1 ft. deep; for a double tier 3 ft. 5½ ins. by
1 ft. 7 ins., and for two double tiers 3 ft. 5½ ins. by 3 ft. 4 ins.
24 ins. or 30 ins. square on face and 22 ins. deep, is suggested.
2 ft. 5 ins. for a Scotch bin, or three rows in England; and 2 ft. 10 ins.
or 3 ft. 2 ins. for four rows. Bottles are stowed with sawdust only
when on the ground; (Bran has been used instead of sawdust
with the probable result of a worm eating the corks); or a
line of laths is placed between each tier in height, and seventeen
tiers high will take up 5 ft. 4 ins. A bin should not be less than
2 ft. 6 ins. high, and it is rarely used more than about 6 ft.
At Merchant Taylors' hall, an iron bin 5 ft. high, 2 ft. 6 ins. wide
and 4 ft. deep, contains a pipe of wine, well. A "pipe bin" by
wine merchants is 3 ft. 5½ ins. long, 3 ft. 1½ in. deep, and 3 ft.
3 ins. high, allowing a projection of 3 ins. to protect the ends
of the bottles. A pipe of

Marsala = 93 gallons or 46 or 52 doz.
Madeira = 92 gallons or 44 doz.
Teneriffe = 47 doz.
Butt of Sherry = 108 gallons, 51, or
52 doz.

Bucelas = 57 doz.
Cape = 44 doz.
Port = 115 gallons = 54 or
56 doz.
Lisbon = 57 doz.

A hogshead of Claret = 46 gallons, gives 22 dozen.

A pipe is 5 or 6 ft. long and from 30 to 36 ins. diam. which
requires a space of about 4 ft. 9 ins. high, 4 ft. 2 ins. deep, and
2 ft. 8 ins. wide. Claret and champagne bottles require about
2 ft. in depth for two rows and may be calculated at 3½ ins. and
4 ins. respectively in diameter; pint bottles, imperial measure,
at 10 ins. high and 3½ ins. diameter, require only 14 ins. in depth
for two rows.

In the 1862 Exhibition was shown the French way of stacking
wine by a light iron rack or cage corrugated to take each bottle,
porte bouteilles en fer, with a light iron gate and lock. A "cellular
wine-bin" of wood invented some years previously for private

use by Geo. Parminter, was shown in the English division. Wrought-iron wine-bins adapted for brick-arched vaults, or cellars with flat ceilings, were put forward 1867 and 1871 by which time the durability had been proved nearly forty years. The shelves are plates or rods of iron laid on bars resting on the crossbars of the lattice uprights or divisions, removable at pleasure. Another registered iron bin has a separate rest for each bottle resting on an upright curved bar, etc., and between each pair is an upright bar. Various arrangements are shown in trade pamphlets. The Slider wine-bin has iron rods for each row secured to uprights. Merchants supply a bin-case for two dozen bottles, which allow of being stacked in small cellars.

WINE MARKET, cellar (Fr. *halle aux vins*). BRUYÈRE, *Études relatives à l'art des Constructions*, fol., Paris, 1823, i, pl. iv, gives the Entrepôt général des vins et eaux de vie, at Paris. At Bordeaux; the very large wine-cellars popularly called *les chais* in several localities. The London Docks; under the warehouses is a series of the most magnificent wine-vaults in the world, over an area of 19 acres, ample storage for 66,000 pipes of wine and spirits; it is the depot for the wine merchants of London.

WINE YELLOW. A pale yellow with a little red and grey, represented by topaz and fluor spar.

WINFORD (WILLIAM DE). See WYNFORD (W. de).

WING (Gr. *PTEROMA* and *pteromata*). The lateral wall of the cells of a temple, and thence the spaces between the walls and columns of the peristyles. **PTERON.** The left and right wing of a long façade looking at the spectator; those at each end of, or projecting from, the main edifice. The gathering side of the roof of a fireplace; **CHIMNEY WING.** 25.

WINGERWORTH STONE. A stone obtained from near Chesterfield, in Derbyshire, where it is used in the buildings and its neighbourhood, as ashlar and for paving. It is greenish coloured, and belongs to the lower new red sandstone formation and is only obtained in thin beds; *BUILDING NEWS Journal*, 1857, iii, 1045. Its breaking weight in the centre is given as 3784.75 lbs. and 2773.50 lbs. on two specimens each 3 ft. long bearing, 1 ft. wide and 4 ins. thick; *ARCHITECT Journal*, 1850, ii, 329.

WING WALL (Fr. *dossier*). The projecting wall at each side and end of a bridge, either straight or curved, to sustain the earth. The drawing of it offers some difficulty when the embankments or cuttings are very high, as explained by R. G. CLARK, in *CIVIL ENGINEER, ETC., Journal*, 1848, xi, 43. BRES, *Railway Practice*, 3 series, 4to., 1837-47. 5.

WINIHARTUS with Isenricus, monks, are mentioned as the builders of the church of the famous monastery of S. Gall, 829-38, or cir. 920, for abbot Gozpertus. Ermenrich calls Winihartus the "Dedalus" of his time. Notkerus, lines quoted by, in MABILLON, *Annales Ordines S. Benedictines*, fol., 1703-39, ii, 570, referred to in *ARCHÆOLOGICAL INSTITUTE Journal*, 8vo., 1848, v, 86. LENOIR, *Architecture Monastique*, 4to., Paris, 1852-6, i, 35. 68.

WINKEL (SIMON), 1470 designed and built the tower of the town hall at Enkhuyzen, in Holland. 24.

WINKLER (BERNHARD), of Rosenhain, *baumeister* with L. Aeltlin, at Ulm cathedral carried out after 1502 the separation of the side vaulting, and 1507 put up the last column of the sacristy on which is the incense burner of G. Sürlin. 68, 92.

WINNING. The Scotch term for a habitation, a residence. The sinking through a soil to form a shaft as to a coal-mine; STANLEY, *Some Plans adopted in the North of England of Sinking through Quicksands*, in *CIVIL ENGINEER, ETC., Journal*, 1841, iv, 223.

WINNOCK, Windock, windak. The Scotch term for the diminutive of window.

WINSFORD QUARRY at Winsford, near Okehampton, North Devonshire. The stone is in layers of "white", "grey", and brown, the first being the lowest is the superior stone, which consists of a silicate of aluminum containing about 2 per cent. of silicate of calcium, oxide of iron being deposited in thin

layers between the strata, as well as a little sulphate of copper, and a few gold spangles. It is a hardish stone, easily worked when fresh, hardens by exposure to the atmosphere; and can be supplied in any reasonable size. In the interior of Holsworthy church are specimens, which after 600 years' wear show the chisel-marks apparently as fresh as when made; in Beaworthy church and its neighbourhood; all the stations, bridges, and viaducts, along the line of London and South-western railway from Okehampton to Holsworthy, and in numerous other erections in the neighbourhood.

WINSLEY GROUND STONE. A weather stone of the BATH quarries; sound, mild, and free working. For plinths, sills, and weatherings it is well suited. In colour it is brown with a reddish tinge. Blocks from 3 to 4 ft. deep in bed and of any ordinary length are easily obtained.

WINSTANLEY (HENRY), resided at Littelbury, Essex, and acted as "clarke of the works of the palace of James II" at Audley End, Essex, and at "that of Newmarket"; he is so recorded in the list of the board of works for 1704. It was erected 1603-16 for Thomas Howard earl of Suffolk. Winstanley engraved three plans and twenty-two views of this mansion, in folio, with 1676 on one plate, and dedicated the work to James earl of Suffolk, and to sir C. Wren; he states therein that "he had seen the most renowned palaces of France, Germany and Italy", and thought foreigners should be able to see this building, which is said to have been designed 1603 by Henry HOWARD, earl of Northampton (died 1614), for his nephew Thomas, by LLOYD, *State Worthies*, 12mo., 1670, p. 781. GRIFFIN, lord Braybrooke, *Audley End*, 8vo., 1836, p. 81, states that a model was obtained from Italy at a cost of £500, of which some mutilated portions remain; and considers it was designed by J. Thorpe, as a plan of it with pencilled alterations is given in his book of drawings at sir J. Soane's museum; B. Jansen was the mason, and N. Stone was also employed in carving. Winstanley had ingenious contrivances at his house in Essex, and waterworks at Hyde Park corner, existing up to 1707 September, as noticed in the TATLER. He designed 1696-1700 and built the first Edlystone lighthouse, which with himself in it was destroyed in a storm November 26, 1703, as related in SMEATON, *Edlystone Lighthouse*, fol., 1793, with copies of the scarce engraving of Winstanley's work. He had a son HAMLET, who, born 1700, studied under the Knellers, went to Italy, and on his return took chiefly to engraving. His copperplates were sold at Essex house March 18, 1762, among them was that of the cupola of S. Paul's after Thornhill. He was buried at Warrington, Lancashire, May 20, 1761, aged 61. WALPOLE, *Anecdotes*.

WINTER GARDEN. It should contain such trees, shrubs, and plants as are in perfection or retain their verdure in winter; grouped and arranged in the natural manner; a dry gravel or paved walk throughout; situated near the mansion; and in it the conservatory might be placed; the paths paved with Dutch clinkers rubbed down to true faces. This addition has been of late years available by the designs of Paxton and others. The conservatory in the Botanic gardens, Regent's Park, was so called in 1851. In England, winter gardens are generally enclosed, and covered with glass, being large enough for concerts, balls, theatricals, and public meetings, as at Southport, Torquay, Eastbourne, and Bournemouth. Lyon, 1847, by H. Horeau; in *CIVIL ENGINEER, ETC., Journal*, 1851, xiv, 265 plate; the *jardin d'hiver* of Paris. In some continental towns there is a "winter" as well as a "summer" theatre.

WINTER ROOM; see TRICLINIUM. A glazed room on the flat roof of a hospital, warmed for the use of convalescents.

WIPED JOINT. In plumber's work. The ends of the pipes to be joined are scraped clean, one pipe expanded with a box-wood tappit, the other pipe shaved to fit therein. The pipes are painted with "soil" (lampblack and size) on the parts where the solder is not wanted. The plumber then takes his bowl of metal and with his splash-stick throws some on the joint ends until the pipes are warmed up. Then, having in his hand a thick pad,

the surface of which is covered with grease, his labourer pours some molten solder into the hollow of the pad, and the plumber immediately "wipes" it round the joint of the pipes. It requires practice to do it properly; and the apprentice usually gets a burn or two. In 1882 a patent proposed to do away with this old-fashioned method, by inserting a short length of metal into the two pipes to be joined, finished by soldering the three together all being flush outside.

WIPE SOLDERING. A quantity of soldering wiped into the angle of leadwork to support the vertical piece.

WIRCH (JOHANN), born 1732 at Prag, 1764-5 built or designed the prince archiepiscopal residence with chapel, a good building in the French style. He died 1802. 68.

WIRE. A metal elongated by the operation of "wire drawing", which consists in passing a piece of ductile metal through a series of holes, successively diminishing in diameter, formed in a hardened steel plate called a "draw-plate" so as to reduce its cross section to the size of the rod and figure required. BECKMANN, *Inventions and Discoveries*, 8vo., 1797-1814, relates the history of the subject. In early times metals were beaten out into thin plates, and then cut, and rounded by hammering and filing. The machine appears to have been invented by Rudolph of Nienberg about 1400. As holes in iron or steel draw-plates will enlarge with wear, W. Brockedon in 1819 obtained a patent for making the holes in a draw-plate of diamonds or other hard precious stones. URE states that by a ruby pierced with a hole 0.0033 of an inch diameter, a silver wire 170 miles long, has been drawn so perfectly uniform that no difference could be detected, either by weighing portions of equal length, or by measuring with a micrometer. Gold wire, and silver-gilt wire has been long used for filigree work and twisting round threads. The company of gold and silver wire-drawers of London were incorporated 1693; H. STEWART, *History*, 8vo., 1888. Brass wire employed for drawing is now made of a compound metal, having the appearance of copper (which itself is too brittle), strong in proportion to its extreme tenuity, and soft and pliable to a degree, and called red brass wire. 14.

In the Exhibition of 1851 Belgium sent a roll of galvanised iron wire, 1,476 ft. long.

To measure with, 1582, 1590; see LINE.

To diminish an ECHO. Six ordinary blind cords were placed across, at the height of 19 ft. 6 ins., in the Presbyterian church at Valetta, in 1877-8, for the purpose of improving the acoustics; a description is given in *BUILDING NEWS Journal*, 1878 (?). Used at Bath Abbey 1874; B. N. J., xxvi, 54, 82, 602, 629. At Chapter-house, York cathedral, a failure; *BUILDER Journal*, 1876, xxxiv, 1202. In S. James's church, Lower Clapton, June 1878. *The Cure of Echo*, by DREW, at INST. OF ARCHITECTS OF IRELAND, in *CHURCH BUILDER Journal*, 1874, p. 102. The new council chamber at the Guildhall, at 19 ft. 3 ins. above the floor, being above the capitals, has had a couple of wires strained across it from near the meeting of each of its twelve angles, hence twenty-four wires, which with some additional drapery, is believed to have effected great improvement. Wires have also been placed in the church of S. Mary Aldermanbury.

WIRE FENCE. Besides the remarks s. v. FENCE, it may be added that GLPIN, *Hints on Landscape Gardening*, 8vo., 1832, p. 217, appreciates a wire fence as best suited near the house, or approach. BOOTH, in the *GARDENER'S MAGAZINE*, describes how it was then best made for training espalier fruit trees upon; CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 49. YOUNG, *System of Ely Fencing in its Various Forms, as applicable to railway purposes*, 23 pl., 4to., n.d. A patent galvanised steel barb wire, four point ordinary, with barbs six inches apart, is being commonly fixed at the top of fencing to prevent animals getting over it.

WIRE FOUNDATION or LATHING. A substitute for wood laths, in partitions and ceilings. A fireproof ceiling of wire work was used at Chester lunatic asylum, the wires about $\frac{1}{4}$ inch apart, galvanised or japanned to prevent corrosion; *BUILDER Journal*, 1849, vii, 317.

Before 1884 a corrugated wire fireproof lathing was patented by ... Stanley, as shown at the Health Exhibition of that year. A patent for "rolled wire lathing" was taken out 1885 by R. Johnson of Manchester. It is formed of galvanised wire netting, $\frac{3}{4}$ in. or smaller in mesh, laid on strips of varnished hoop iron about $\frac{5}{8}$ in. wide, fastened by special staples edgewise across the joists from 6 ins. to 9 ins. apart. The netting is then spread on this iron backing and stapled to the joists, leaving the width of the slip for the plastering. It is considered to be practically fireproof, and has been applied to secure girders and columns; cut in *BRITISH ARCHITECT Journal*, 1885, Sept. 11, p. 120. He has also a patent corrugated wire lathing for the same purpose. CEILING. LATHING. PARTITION. 1.

WIRE GAUGE. A scale of numbers first adopted at Birmingham, and extensively employed both in this country and abroad, to designate a set of arbitrary sizes of wire, varying from about half an inch down to the smallest size usually drawn. There is no authorised standard in existence, and a great number of gauges have come into extensive practical use, differing materially from each other; L. CLARKE, *Birmingham Wire Gauge*, 8vo., 1867; 1869. HURST, *Architectural Surveyor's Hand Book* for 1882, p. 6-8; MOLESWORTH, *Pocket Book of Engin. Formulae*, for 1865, p. 189. 1.

WIRE ROPE. Iron wire has been applied from about 1839 in the manufacture of ropes, which are proved to be very superior in strength to those made of hemp, weight for weight. In 1842 it was referred to as likely to become of extensive use for forming foot bridges over canals and railway cuttings, a rope $2\frac{1}{2}$ ins. circumference and 100 feet long was made at that time; Smith's patent wire rope was described at SOCIETY OF ARTS, 14 and 21 December 1842, and tables of strength given (also in CIVIL ENGINEER, ETC., *Journal*, 1843, vi, 27). Newall's system of a hempen core with six iron strands around a central one, is described by Carpmael at the Royal Institution; *BUILDER Journal*, 1845, iii, 250. The strength of wire ropes is given *idem*, 1859, xvii, 671: and in 1882 the formula is given as the circumference in inches being c, the breaking weight in tons will be $1.40 c^2$ for iron wire; and $2.50 c^2$ for steel. This invention is now extensively used in suspension bridges: and in minor purposes, e.g., steam plough steel wire ropes, copper rope lightning conductors; strand fencing; sash cord; flexible steel and iron wire ropes for small gear, etc. Dixon, Corbitt and Spencer issue useful tables of the weight per fathom of hemp rope, and the same with breaking weights of galvanised wire rope from 1 inch to 8 inches circumference. 1. 14.

Of copper; LIGHTNING CONDUCTOR, wire rope instead of metal rod was approved at Munich about 1830. Of iron. 0.1 in. diameter iron wire rope, tensile strength of 36 tons per square inch; *BUILDING NEWS Journal*, 1869, xvii, 402. One of 4.6 in. at the Niagara bridge. Experiments at Woolwich on iron and hemp; CIVIL ENGINEER, ETC., *Journal*, 1848, xi, 352. Used for picture hanging and for brushes.

WIRE-WOVE ROOFING. A transparent material, patented 1888 by Allport, being composed of close wire covered with a lac or varnish admitting a certain amount of light: it is waterproof, light, strong, and durable for temporary purposes or sheds; it requires much lighter framework than either iron or glass; it is fixed with nails or screws. It is made in sheets of certain sizes.

WIRMBOLDE, cementarius. See ODO.

WISBECH (JOANNES DE) or John of Wisbeach, a monk of Ely, 1321-49 supervised the erection of the chapel of S. Mary, now Trinity church, on the north side of Ely cathedral, designed, as it is considered, by Alan de Walsingham, subprior in 1321. He died cal. July 1349 and was buried in the chapel. John Attgrene was 1311-86 the master mason at the cathedral. The accounts of the expenses are given in BENTHAM, *Ely Cath.*, 4to., Camb., 1812. LELAND, *Collectanea*, 8vo., 1770, ii, 606. DUGDALE, *Monasticon*, fol., 1817, i, 464.

WISE (THOMAS), by patent 6 June 1678, 30th Charles II, was

appointed master mason in the king's board of works; 20 June 1685 he appointed his son Thomas as deputy; and died 28 January 1685-6; J. Oliver succeeded. Another THOMAS WISE (perhaps this son) was 1714 appointed master mason at, and appointed his son as deputy.

WISMAR. A seaport of Mecklenburg-Schwerin, situated on a bay, called the Walpich, one of the best harbours in the Baltic. From 1648 to 1803 it belonged to Sweden. It has walls and moat and eight gates. The three churches are large, of xiv cent. and fine specimens of brickwork. Nicolai kirche is the largest, it has one tower with a saddle-back roof; the vaulting is 130 ft. high; the choir with apse dating 1381 was directed by Heinrich von Bremen, rathmaurermeister, and 1437 meister Heine Muenster was employed upon it; a brick gable is in ESSENWEIN, *Norddeutschlands Backstein*, fol., Carlsruhe, n.d. The Marienkirche is smaller, has one tower with a saddle-back roof; the choir 1339-54 (decorated) with apse was designed by J. Grootte; the remainder is xv cent.; a bronze font within a good railing. S. George, 1340 has a square end with two very large windows each of three lights, about 70 ft. high; a very fine interior; it is seldom noticed by visitors. Besides these is the *fürstenhof* 1554 formerly the residence of the dukes of Mecklenburg, now used for municipal purposes; LUBKE, *Deutschen Renaissance*, 8vo., Stutt., 1873, p. 186, 729-35; a good modern town-hall; court-house; a large schoolhouse; theatre 1800 by ... Thormann who built many private houses; also several houses of xiv cent. with examples of renaissance ornament in brick. A. G. HILL, *Ecclesiology, etc., of some Towns in Mecklenburg, etc.*, in *ARCHÆOLOGIA*, 1886, xlix, pt. 2, 311-3. 9. 14. 28. 50. 68. 92. 116.

WISP and wisp. A measure for glass; apparently less than a wave or waye; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durham, 1859, p. 76, 359.

WISTA. See VIRGATE, a quantity of land.

WIT or WITTE (PETER DE), born about 1548 at Bruges, was also painter and sculptor; studied in Italy (so hence called Candido, and Candidus, and Candito) under G. Vasari (died 1574); and the earliest introducer of Italian architecture into Germany. In 1575-1616 he designed the old immense palace at Munich; the staircase is very good; it was damaged in the fires of 1729, 1749, and 1762. In 1603-12 he executed there the tomb of black marble and bronze in the cathedral, to king Louis IV, the Bavarian (died 1346), with its six life-size figures at the side and angles (MÜNCHEN). The effects of his style are shown in the eighth room on the first floor of the Bavarian museum, *Handbook* (Murray), edit. 1873, p. 75. He died in 1628 at Bruges. REVUE DE BRUXELLES, 8vo., Oct. 1837, p. 10. COMMISSION ROYALE D'HISTOIRE DE BRUX., 8vo., Brux., 1847-8, xiv, 58 and 564. DELVENNES, *Biog. de Pays Bas*, 8vo., Mons, 1829, i, 167. 3. 5. 25.

WITH. A partition separating flues in a stack of chimneys; called "brig" in a Scotch specification of 1754, and "midfeather" in Lancashire. "All withs the inside of such chimnies, shall be four inches and a half in breadth," by 7 Anne, c. 17, § x, 1708. "All withs, in the inside of such chimnies shall be the breadth of a brick or four inches," 12 George III, c. 73, § viii, 1772. "The breast, wing, and wieths of a chimney," "the cross wieth," MANDEY, *Mellificium Mensuris* or *Marrow of Measuring*, 8vo., 3rd edit., 1717; 4th, 1727, p. 382, App., *Measuring of Chimneys Reformed*, as "against Leonard Sowersby, the late notorious measurer". The placing the funnel 3 ft. by 16 ins. by the side of the chimney was an invention only "of late years", to prevent the chimneys coming so far into the rooms when the funnels are placed behind them. "Wieth or withe" of a chimney. "Width" in NEVE, *Complete Builders' Guide*, 8vo., 1736, s. v. Chimney. "Wyths and pargetting"; "a chimney with a double funnel towards the top, and a double shaft,—with a middle fetter that parts the funnels in the shaft above the roof"; BUILDERS' DICTIONARY, 8vo., 1734, s. v. Chimney. "The widths of chimneys are those partitions within side, which separate the funnels one from the other"; LANGLEY, *London Prices*, 8vo.,

1750, p. 327. A case on this question is reported in *BUILDER Journal*, 1862, xx, 794, with references to the Metropolitan Building Act.

WITH. A rod used for binding down the straw in THATCHING. 4.

WITHDRAWING ROOM. The term in old plans for a room presumed to be for the purposes of the DRAWING-ROOM of later and present times.

WITTEBERG (...), designed 1817 a temple to the Holy Saviour at Moscow consisting of three churches one above the other; but the scheme was given up.

WITTE (JACOB EDUARD DE), was architect and director-general of the works at Amsterdam, where 1774 he designed and rebuilt the Dutch theatre on the Leydsche plein, the former one by van Kampen having been burnt down. 24.

WITTE (PETER DE); see WIT (P. DE).

WITTLICH (JODOCUS VON), 1513 constructed the intricate groined vaulting of the church of S. Mathias, near Treves. 92.

WITTMELERS (meister ... VON), 1347 began the Ægidien-kirche, at Hannover. 92.

WIVELSFOORD. See WELLESFORD quarry.

VLADIMIR. See VLADIMIR, in Greater Russia.

VLADIMIRIA. See VLADIMIRA, in European Russia.

WOAD. The blue dye prepared from the *Isatis tinctoria* of Linneus, extensively used in the middle ages, but now often superseded by INDIGO. Woold, woud, or weld, a species of *Reseda*, is the dyer's weed, yellow weed, and wild woad, which gives a yellow dye for cotton, wool, silk, and linen. Woad is grown near Wisbech, and is used in the west of England cloth mills. 14.

WOCULA. A measure of land in India; see COLAGA.

WODE (JOHN) or Wood, mason, 14 Henry VI, 1439 made a contract with the abbot of S. Edmundsbury, to restore the bell tower "in all mannere of things that longe to free masonry", the wages are mentioned, and "borde for himself as a gentleman and his servaunt as a yoman and two robys, one for himself after a gentlemen's livery"; *ARCHÆOLOGIA*, 1831, xxiii, 330. 19.

WODNESBERG (JOHNS), at Christ Church, Canterbury; see CHILLENDEY (T.).

WOLBERO or ALBERO, laicus. A name that occurs 1208 in an inscription on the south wall of the church of S. Quirin, at Neuss, near Düsseldorf; 1209 as the *magister* who began the stiftskirche at Reuss; and 1219 finished the vaulting (*wolbung*) of the church of the apostles at Cologne. COMITÉ HISTORIQUE DES ARTS, etc., *Bulletins*, 8vo., Paris, 1842-3, ii, 513. LENOIR, *Arch. Mons.*, 4to., Paris, 1852, i, 35.

WOLFRAM, of Königsberg in Franconia, 1421 was sent for to Wurzburg to finish the cathedral there begun 1331. 68.

WOLKOFF or WOLKOW (FEODOR). See VOLKOV (...).

WOLMUET (BONIFACIUS), of Frankfort-on-Main, 1547 became *baumeister* at S. Stephen's church at Vienna. 26. 68.

WOLOGDA. See VOLOGDA, in European Russia.

WOLONER (OCT...). A native of Poland, practised 1103-70; CHODZKO, *La Pologne Hist.*, etc., in *EAST, Hist. de la Guerre*, etc., 7th ser., 4to., Paris, 1855-56; and p. 94.

WOLRYCH (JOHN), Woolrych, Woolrich, Worlich, and Wulrich, was master mason at the recommencement 1464 of the chapel of King's Hall, Cambridge, completed about 1484. In a deed dated August 17, 1476, at Caius college, he is named as the master mason (at the erection) of King's college chapel; John Bell, mason warden of the same works, with Richard Adam and Robert Dogett or Vogett, carpenters—WASTELL did the vaulting. WALPOLE, *Anecdotes*, 8vo., 1862, i, 107 note. WILLIS AND CLARK, *Arch. Hist.* — Cambridge, 4to., Cambridge, 1886, ii, 450-1; i, 629. BRITTON, *Architectural Antiquities*, 4to., 1807, i, p. 4, of King's College chapel. G. G. SCOTT, *History of English Church Architecture*, 4to., 1881. Brit. Mus., Cole MS., xxx, 226b. 19.

WOLSTON (JOHN), freemason of Exeter, probably succeeded

W. FOUNDYNG and W. Gervys (1396-7); and 1427 he with John Harry, freemasons, were sent to Beere to purchase stone; BRITTON, *Exeter Cathedral*, 4to., 1836, p. 97. 19.

WOLT and WOULT. A vault and arch.

WOLVEN, or Wolvesey (THOMAS). See WOLVEY (T.).

WOLVESTON (RICHARD DE), *ingeniator*. Cir. 1170 he is noticed as "Ricardi ingeniatoris de terra sua de Wolveston", and as "vir artificiosus fuisse operi, et prudens architectus in omni structurâ artis forissecæ"; he was employed by bishop Pudsey (1153-94) in works at Norham castle, and was probably succeeded by WILLIAM ingeniator 1197; SURTEES, *History of Durham*, fol. 1820, iii, 149, who iii, 148, states that his seal shows a wolf passant. SURTEES SOCIETY, *Reginaldi Mon. Dunelm. Libellus*, etc., 8vo., 1835, p. 95-7, 111, 300; 333. BUILDER *Journal*, 1863, xxi, 499, which states that on the completion of these works (*castellaria*) he returned to Durham, where he lived in great repute among his fellow-citizens; LONGSTAFFE, at ARCH. and ARCH. SOCIETY OF DURHAM, etc., for January 1863.

WOLVEY (THOMAS), Woluen, Wolver, Wolven, Wolvesey, or Wolvesley, *latomus summus in arte, neonon armiger*—Ric. secundi quondam regis Anglie qui obiit 1430, etc., as on the stone in S. Michael's church at S. Allan's; i.e., master mason or surveyor of the king's stoneworks, and also esquire to the king's person. WEEVER, *Funerall Monuments*, fol. 1631, p. 582; 1767, p. 344. Brit. Mus., Cole MS., xxx, 226b. 19.

WOLVEY (RICHARD), or Wolven, *latomus*, son of the above John, with his wife and children, are recorded in the same church. He died 1490. GOUGH, *Sepulchral Monuments*, fol., 1796, ii, 95. 19.

WOMAN HOUSE. The Scottish term for a laundry.

WOMBLE. An auger, brace, or drill. WIMBLE. Wummil. RESTWOMYLL 1464, restwymbyll 1446, a trough of wood or metal placed horizontally to support the tool in use, and to ensure it boring a hole accurately, as through the whole length of a tree to form a pump or water conduit. R. R. R.

WONEFORD STONE, or Wenford, in the neighbourhood of Exeter, was used for the vestry of S. Mary's chapel, in the cathedral, rebuilt temp. Henry VI (1422-61).

WOOD. Cord or chord wood is the thickest ends of the branches of trees cut into lengths convenient in burning for charcoal. A "cord of wood" is 4 ft. square by 8 ft. long = 128 ft. cube. HAVILAND, *Imp. Practical Measurer*, 8vo., 1817, p. 497, gives it as 4 ft. high, 3 ft. wide, and 16 ft. 3 ins. long. = 195 ft. cube. A stack of wood is 3 ft. over, 3 ft. deep, 12 ft. long. = 108 cub. ft. Block wood being great logs are sold by the cord and small by the stack (cir. 1800). In Russia a cord is 88½ ft. cube Engl.

WOOD, in landscape gardening. A wood is well adapted both for ornament and utility. It is formed at first, by planting timber trees at such distances as would form a grove, and filling up the interstices with the sorts intended for undergrowth. This is the most generally applicable kind of plantation, and commonly the most profitable, particularly in strips and belts. There, the undergrowth thrives best; thickens the strip below; completes the shelter; and by concealing the real breadth, gives a massiveness and grandeur to narrow plantations, which they can never have if planted in the grove style; LONDON, *Country Residences*, 4to., 1806, ii, 526.

WOOD. The name given to TIMBER after it has been cut up, or reduced, for use by carpenters, joiners, cabinet-makers, and others. It is all that part of the plant that exists between the pith and the bark: also applied to those bundles of tissue which are called woody. The two great classes of plants, Exogens and Endogens, yield very different kinds of wood from the manner in which their fibres are deposited; the latter have no bark and are generally hollow in the middle; in the former the stems are solid and the older the tree becomes the more solid is the wood; the centre is called HEARTWOOD, the outer sapwood (ALBURNUM).

The woods used in furniture are called "fancy woods", and

the scarcer sorts are obtained as veneers; mahogany, lignum vite, ebony, rose, king, lance, beef, tulip, zebra, satin, sandal, iron, canary, purple, snake, calamander, coromandel, amboyna, etc. Other furniture woods imported 1855, are, Sequoia or Wellingtonia, the burr wood of which resembles that of the Thuya from Algeria, the Citrus of the Romans: figured American black walnut from 1851; grey walnut 1870 of the United States; Australian blackwood; American cherry; Nicaraguan ash burr, resembling Amboyna or Kiabuka wood; American curled ash veneer; and American laurel. *Illustrated Catalogue of the Exhibition of 1851, and Jurors' Reports*, partly reprinted in CIVIL ENGINEER, etc., *Journal*, 1852, xv, 307-12. BUILDING NEWS *Journal*, 1856, ii, 80, 131, 660, 730, 753, 803. BUILDER *Journal*, 1846, iv, 446. SEPP, *Representation of Inland and Foreign Wood, as well Trees as Shrubs*, 58 plates of 493 specimens of polished woods, 4to., Amst., 1773. SOCIETY OF ARTS, *Transactions*, vol. 1, pt. 2, p. 140-170. HOLTZAPPEL, *Descriptive Catalogue of Woods—in Ornamental Art*, 8vo., 1843. *Notes on the Paris Exhibition, 1855, The Woods of Algeria*, by sir W. Hooker. The collection at Kew gardens.

WOOD; DURATION OF. In 1849 it was stated that the best mode of prolonging the duration of wood is to char it, and then paint it over with three or four coats of pitch; simply to char the wood was of very little utility, as were also saturations with various salts, acids, etc.: Experiments by G. S. Hartig, in CIVIL ENGINEER, etc., *Journal*, 1849, xii, 383; and ARCHITECT *Journal*, 1849, i, 369; 431. A statue of Ra-em-ké, of the IV dynasty, now in the museum of Egypt, at Boulak, Cairo, found by Mariette bey in a tomb at Sakkara, considered to be nearly 6,000 years old. There are several other very old figures of wood in the British museum. A Cypress wood coffin, with finely carved Grecian ornamentation, is among the Kertch antiquities in the Hermitage at S. Petersburg; J. B. ATKINSON, *Art Tour to Northern Capitals*, 8vo., 1873, p. 266. It is stated that creosote driven through the pores of wood by hydraulic pressure, effectually retards decay.

FIBROUS SLAB or patent wood. FIREPROOF. INCOMBUSTIBLE. 1884 "The Pliable wood decoration company" by a patent chemical treatment of veneers rendering them supple as leather.

WOOD (HENRY). A native of Holme or Hulme, Yorkshire, was "clerk of the works under sir C. Wren at S. Paul's cathedral, and whose curious accounts of that great work are now in the author's possession"; WHITAKER, *Whalley*, fol., 1818, p. 353; and fol., 1876, ii, 207.

WOOD (JOHN), called "Wood of Bath", a native of Yorkshire. In 1707, 1721, the first acts were passed for amending the roads of Bath. He commenced operations there in 1727 (*Description*, etc.). To his taste, energy, and skill, assisted by the liberality of Ralph Allen, who developed the stone quarries upon his estate near, the city of Bath is in a great measure indebted for its architectural elegance. He built, or contracted to build, over a site three times the then extent of the city, and he is said to have been the first architect who conceived and carried out the idea of uniting several distinct dwelling-houses in one grand architectural design, as the north side of Queen's square, of which the first stone was laid January 27, 1729; this square, with the Bath mineral water hospital or general infirmary, adjacent, were built on the property of Robert Gay, an eminent surgeon in Holborn; (MITFORD, *Principles of Design in Architecture*, 8vo., 1809). The North Parade is 580 ft. long and 52 ft. wide, the South Parade is 400 ft. long, both being raised on arches 18 ft. above the original level of the ground; the first idea having been to erect piles of buildings around an area 620 ft. by 310 ft., to be called "the Royal Forum", the south parade forming the north side or wing of the centre pile. The square and parades had stone balustrades, for which common iron railings have since been substituted. Behind the top of the north parade is the town residence of R. Allen, the front designed by Wood, who also designed the magnificent Royal Circus. Wood street perpetuates his name in the city. In 1727 a court of six houses

near the Cross bath (Chapel court and Church buildings). Eagle house, at Bathaston, is a very characteristic specimen of his earlier style (R. E. Peach). 1728 he designed S. John's hospital or the "Blue Alms". 1732-5 S. Mary's chapel, Queen square, Roman Doric (EGAN, *Walks through Bath*, 8vo., 1819, p. 138). 1734 Belcombe-brook villa at Bradford-on-Avon, for Francis Yerbury; 1735 a curious little villa forming a perfect square, near the spot on Lansdown where sir Bevil Grenville fell; and 1745 Titanbarrow loggia on Kingsdown (Bathford) for Mr. Southwell Pigott. 1735-6 he commenced the works of repair to Llandaff cathedral which continued for many years. 1736-43 Prior park, Widcombe, for Ralph Allen, the frontage being 1,300 ft., but the eastern wing was by R. Jones; (WATTS, *Views of Seats*, fol., 1785, pl. 75); in 1829 the estate was purchased and adapted as a Roman Catholic college, when the pavilion was pulled down and on its site in 1844 was erected the chapel designed by J. J. Scoles; it was put up for sale at end of June 1856 (BUILDER *Journal*, 1856, xiv, 376); followed in a few years by a return of the collegiate body: (the stone quarries are described, *idem*, 368, 386). 1738-42 the mineral water hospital, Union street. 1740-43 opened, the exchange at Bristol, 110 ft. by 148 ft. deep—a glass roof was proposed 1869 to be put over the quadrangle; an alteration is noticed in BUILDER *Journal* 1847, v, 453. 1748-55 with his son, the exchange at Liverpool (PICTON, *Municipal Records*, 4to., 1883-6, ii, 159, 164). 1752 king Edward VI's grammar school, Broad street. Designed a room in the mansion house at Liverpool, very similar to Coopers' Hall at Bristol (also attributed to J. Halfpenny). Redland Court, near Bristol, by him, is a perfect Italian villa with terraces, etc., complete.

The Harl. MSS. 7354, 7355, in Brit. Muscum, are *Descriptions of Stanton Drew*, by Wood, dated Nov. 1, and of *Stonchenge*, dated Dec. 15, 1740, addressed to the earl of Oxford. He published *The Origin of Building, or the Plagiarisms of the Heathens detected*, fol., Bath, 1741. *Description of the Exchange at Bristol*, 8 pl., 8vo., Bath, 1745. *Choir Gaur*; described, restored, and explained, 6 pl., 8vo., 1747. *Essay towards a description of Bath*, 8vo., in 2 parts, 13 pl., London, 1742; 2nd edit., 2 vols., 22 pl., 1749; and reissue in 1765. *Dissertation upon the Orders of Columns and their Appendages*, 23 pl., 8vo., Bath, 1750. Wood died 23 May 1754, aged 49 (*Bath Journal*, May 27, copied in BUILDER *Journal*, 1856, xiv, 386) and was buried at Swainswick. Strahan, a rival, not a pupil, 1735 designed Londonderry, in Kingsmead square, for T. Rosewell. BRITTON, *Bath and Bristol*, 4to., 1829, p. 13, 38. RUSSELL, *Growth of Bath*, in B. J., 1858, xvi, 550. LANDSOWN, *Domestic Arch. of Bath*, in BUILDING *News Journal*, 1858, iv, 773. PEACH, *Bath, Old and New*, 8vo., 1888. 14.

WOOD (JOHN), son of the preceding JOHN, completed Gay street, and the Circus, after the designs of his father. 1757 designed Buckland, Berkshire, for sir R. Throckmorton, bart., NEALE, *Seats*, etc., 4to., 1818, i; WOOLFE AND GANDON, *New Vit. Britt.*, fol., 1767, i, pl. 93-7; and Standlynch for James Dawkins, a West India merchant, *idem*, fol., 1771, ii, pl. 81-4; the portico and some internal decorations by N. Revett. May 13, 1767-69, the Royal Crescent of an elliptic form comprising thirty houses. 1769-71, the upper or new Assembly rooms, 43 ft. high, cost £20,000 (redecorated, BRITISH ARCHITECT *Journal*, 9 Jan. 1891, p. 35. 1776 the hot bath 56 ft. square together with the royal private baths in Hot Bath street, seven in number. About the same time the church of Langridge, near Bath. 1779 the church at the village of Hardenhuish, near Chippenham; BURKE, *Vitiation*, 8vo., 1855, 2nd Ser., ii, 4. He died 18 June 1782, and was buried June 24 at the foot of the altar steps in Swainswick church. Revised by R. E. Peach of Bath.

WOOD or WODE (JOHN). See WODE (J.).

WOOD (JOHN TURTLE), F.S.A.; born 13 February 1821. He was an articulated pupil of H. E. Kendall, jun., and practised in London. In 1850 he was in Italy, returned and again practised at Victoria square, Grosvenor place, where 1853 he designed a

house in Oatlands park for J. T. Darke, esq. In the early part of 1858 he accepted the appointment of architect to the Smyrna and Aidin railway, and went out to design the stations; the line was opened 14th Nov. 1861. 1865 he designed the English protestant church (Gothic) at Boudjah, near Smyrna (BUILDING *News Journal*, xii, 638). He commenced his excavations at Ephesus in May 1863, exploring the Odeon and the great theatre; 1867 he commenced his search for the great temple and after six years hit upon the peribolus wall built under Augustus (B.C. 31-14 A.D.); the discovery of the temple itself was effected in 1869. He then returned to England. While resuming the excavations from 12 to 20 ft. in depth, the drum of the *columnæ calatæ* was found with other remnants, to April 1872, when he was in London again; the BUILDER *Journal*, xxx, 106, giving the first illustrations. In 1873 a plan appeared, more of the sculptures were found, all which are now in the British Museum, and the distinct remains of three temples of Artemis on the same site, and of the use of colour. The excavations 500 ft. long, 300 ft. wide, and 22 ft. deep were finally abandoned in the spring of 1874; all these works cost about £16,000 from first to last. On 1 March 1875 it was announced that the Government had recommended him for a pension of £200 per annum. In 1877 he published *Discoveries at Ephesus, including the Site and Remains of the Great Temple*, 8vo., with plates. References to his lectures, meetings at societies, and other notices, are given in the ROY. INST. OF BRIT. ARCHITECTS, *Journal*, 3rd April 1890, p. 275-6; 296. While residing for his health at Worthing he died 25 March 1890, of heart disease, aged 69. Part of the pension was continued to his widow. BUILDER *Journal*, 1890, lviii, 267.

WOOD (RALPH), a common mason, 1727-9 built the arch over the dell of Cawsey Burn, near Tanfield, in Durham, for a level for coal waggons; (a print in the British Museum, dated 1804, gives the size as 102 ft. span and 73 ft. high; abutments about 9 ft. high); it is said to have cost £12,000; his name and date is on a sundial on one of the piers. As a previous timber (?) structure by him had failed, he committed suicide in fear that the stone one should give way. SURTEES, *History of Durham*, fol., 1820, ii, 228, who adds "it is neglected and falling to ruins". BRAND, *Newcastle-upon-Tyne*, 4to., London, 1789, ii, 306.

WOOD (ROBERT), called "Palmyra Wood", born 1716 at Riverstown in co. Meath; studied at Oxford; visited Italy more than once, and 1742 to Chios. In 1750 with his friends ... Bouverie and James Dawkins, and J. B. Borra as draughtsman, he set out to travel through Asia Minor and Syria, but Bouverie died of fatigue. On his return he published *Ruins of Palmyra, otherwise Tadmor in the Desert*, 57 pl., fol., 1753; and *Ruins of Balbec, otherwise Heliopolis in Coelo Syria*, 47 pl., fol., 1757, two important works. His *Essay on the Original Genius and Writings of Homer,—State of the Troad*, 4to., 1775, appeared after his death. In 1759 he was appointed under-secretary of state by the earl of Chatham. (Dawkins senr. built No. 32, Portman square, the large house, it was sold by his son on his father's death, as he then removed to a house opposite; the father paid for R. Wood going to Palmyra, who took the son Dawkins with him, and also for the publication of the two works; he also made himself responsible for J. Stuart's residence at Athens, and had all his original drawings and paintings; he died 80 years old; C. H. Smith, contributor.) Wood was member for Brackley, Northamptonshire, and died 9 September 1771, aged 54, at Putney, where he was buried, having bought Lime Grove, the birthplace of Edward Gibbon, the historian. BEAUTIES OF ENGLAND AND WALES, *Surrey*, by F. Shoberl, 8vo., 1813, p. 111. GUTHRIE, *Old Houses of Putney*, 8vo., 1870. 14.

WOOD (SANCTON), born about 1814, became a pupil of sir Robert Smirke, R.A., and completed his term of five years more with Sydney Smirke, R.A. In 1841 he competed for the Ran-

dolph and Taylor buildings at Oxford; 1845-6 gained first premium for the station at Blackburn for the Blackburn and Preston railway; 1846 the premium of £100 for that at Ipswich; designed those on the Eastern Union railway for Mr. Bruff, C.E.; the old terminus at Shoreditch for Mr. J. Braithwaite, C.E.; various stations between Dublin and Cork, and on the Great Western and Southern railway 1845-7 in Ireland; 1850 the Dundrum station thereon; was architect to the Limerick junction line; Rugby and Stamford railway; and the Syston and Peterborough railways. Among many residences and city offices, he 1851 designed a house in Gresham street, £5,000; 1851-2 the commercial buildings comprising the Queen's insurance office at the north-east corner of King street, cost £8,000 (CIVIL ENGINEER, ETC., *Journal*, xvi, 8; and *BUILDER Journal*, x, 582); 1851 a house on Putney hill for his own residence; 1856-8 Leinster square, Leinster terrace, and Upper Hyde Park gardens, comprising some ninety houses (*BUILDING NEWS Journal*, iii, 277; iv, 418 and 852); and 1857 chambers in S. Michael's alley, Cornhill. Besides being much employed in arbitrations he had been district surveyor for Putney and Roehampton, and from 1866 held that for S. Luke, Chelsea. E. Cookworthy Robins 1846 was a pupil. He died 18 April 1886, aged nearly 71, and was buried in Putney cemetery. *BUILDER Journal*, 1886, i, 761, 795; ii, 660.

WOOD ASH. Blue mortar in London used in mortar for buildings much exposed to the weather, is made of 1 bulk of lime to $\frac{1}{2}$ of ashes. Mixed with water it becomes softened for laundry work. **ASHES.**

WOOD AVENS or herb bennet. The leafage used during the XIII cent., the Early English period. **LEAFAGE.**

WOOD BLOCK FLOORING. Wood cut into blocks of a certain size and laid in the interior of rooms for a floor was the invention about 1856 of W. White, F.S.A. The block is of an oblong form prepared from first or second yellow deals, or any hard wood. *BUILDER Journal*, 1883, xlv, 704, 738, 774, 842, 879; and 1885, xlix, 845.

Wharam's patent improved W. B. flooring 1880.

Lowe's improved W. B. flooring 1883; set in a composition on concrete bed. Geary's patent "premier" system of W. B. flooring; blocks keyed down; 1884.

Geary and Walker, improved patent "Invincible" system of W. B. flooring; each block is firmly keyed to a matrix by metal keys.

Nightingale and Co.'s bevelled principle of W. B. flooring.

Duffy's patent improved and perfectly "immovable Acme" system of W. B. flooring; pinned with three pegs for being laid diagonally, longitudinal grooves along sides to receive adhesive composition; with bonding blocks for insertion in concrete bed. 1887.

New Disc-key system of laying W. B. floors: the blocks are grooved along the sides, and two disc-keys placed at corners binding it to six other blocks, being screwed into dovetailed bonding; with blocks set in the concrete. 1889.

S. Jennings' prepared paraffined flooring, for hospitals and infirmaries.

Ebner's patent "hydrofuge" floor, a cement bed receiving small metal channels, then a bed of mastic which runs into the channels and into grooves formed on the underside of the blocks.

Farmer's registered dovetail grooved W. B. flooring; 7 by $3\frac{1}{2}$ by $1\frac{1}{2}$ thick, each having a dovetailed groove cut each way diagonally on the underside, and laid in cement. 1890 (?).

WOOD BRICK. Called "nog" in Lancashire; "Bilget" (LONDON, *Cottage, etc., Architecture*, 8vo., 1833, § 1066); and "Wall dock", in Scotland. A piece of wood the size of a brick, built into the wall at the necessary heights to which jamb lining, battening, and similar work is to be fastened. A **PLUG** or wedge is a small piece driven in after the work is built. Wright's fireproof fixing block patented 16 June 1881, is to supersede wood grounds, joint pieces, plugging, etc.; it takes and retains nails equal to wood; does not shrink, split, decay, or become loose. Sawdust kneaded with clay moulded as bricks, and burned, are used in the place of wood bricks; the sawdust is destroyed in the fire and porous bricks, giving good nail-hold, result. 1.

WOOD BRIDGE. See **TIMBER BRIDGE.**

WOOD CARVING. The ornamentation of the plain surface of wood, either sunk in, or raised on the surface. **BUHL WORK.** **MARQUETRY.** **FRETWORK.** Lime wood was almost exclusively used by Grinling Gibbons and his pupils for all his magnificent drops and festoons of fruit, flowers, and birds. It is soft and pliable to the tool and less liable to split and splinter than other woods; it takes a stain well and a fair polish. American walnut is good but requires more care in working. Sycamore, holly, and chestnut are also used; the first for bread plates and bowls. English oak, with Italian and English walnut, are very useful for wear. For minute work, boxwood and ebony are the best. Pear tree is used in France in place of the lime. BEMROSE, *Manual of W. C., etc.*, 4to., 1862. *Manuel de Tourneur*, 2nd edit. G. A. ROGERS, *Art of W. C., and a Short History of the Art*, 4to., 1867. E. ROWE, *Wood Carvings at South Kensington Museum*, fol., 1889, etc. AUMONIER, in *BRITISH ARCHITECT Journal*, April 24, 1891, p. 324 and 344. CRACE, *Restoration and Preservation of W. C.*, at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1855-6, p. 129; and ROGERS, *Remarks on G. Gibbons, idem*, 1866-7, p. 179. 1.

WOOD CARVING WORKS are mentioned s. v. Carving; those of 1843 Irving; of 1844 Jordan; of 1840 Braithwaite and Co.; and of 1860 at Belvedere road. Later methods are those of 1861 "Bois durée" of Paris, first rendering the wood soft; then impressed; and hardened; or submitting sawdust under a high pressure and a temperature of 600 tons. By Hawkins, finishing by means of hydraulic pressure under a mould, after the carving has been executed, polished and varnished. J. C. Martin of Barnes, "ceramic wood" (*BUILDER Journal*, 1860, xviii, 104). 1862 use of hot moulds (*idem*, 1862, xx, 165). 1878 National Society of wood carving. 1882 Martin's patent wood carving company. The Decorative Wood company executed carved panels for doors, consisting of a thin veneer of wood on a layer of pulp, the whole pressed in moulds. 1884 the "Pliable wood decorating company" by a patent chemical treatment of veneers rendering them supple as leather. A new "ingenious invention for carving" is mentioned August 1891.

BURY, *Modèles de Menuiserie*, fol., Paris, 1806; and 1825. *Recueil de Menuiserie*, fol., Paris, 1822-3. NOSBAN, *Manuel de Menuiserie*, 2 vols., 12mo., Paris, 1827. THIOLLET ET ROUX, *Nouveaux Modèles de Men.*, fol., Paris, 1837. POTAIN, *Détails des Ouvrages de Menuiserie pour les bâtiments*, 8vo., 1778. ROUBO, *L'Art de Menuiserie en bâtiments et en meubles*, 12mo., 1824. HEIDELOFF, *Art Specimens for Wood Carvers, etc.*, 4to., 1851. VIOLLET-LE-DUC, *Dict. du Mobilier*, 8vo., Paris, 1858. MANGEANT, *Journal de Men.*, etc., 4to., 1863-72. LACHAVE, *Nouveau Collection de Men.*, fol., Paris (1864?). BURY, *Remains of Ecclesiastical Woodwork*, 21 pl., 4to., 1847. TWOPENY, *Specimens of Ancient Woodwork*, fol., 1859. A. J. JONES, *Sculptured Decorative Furniture, illustrative of Irish History*, 4to., Dublin, 1853. SMALL, *Scottish Woodwork of XVI and XVII Cent.*, 4to., Edinb. (1878). STREET, *English Woodwork of XIII and XIV Cent.*, read at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1864-5. *Treatment of Woodwork*, in *BUILDING NEWS Journal*, 1865, xii, plate 244. GRUNER, *Lo Scaffale*; presses in the Sacristy of Sta. Maria della Grazie at Milan, by B. Luini, fol., 30 pl., 1859-60. SANCET, *Stalles d'Auch*, 4to., 60 pl., 1862. ENDLICHER, *Stalls in S. Stephan's at Vienna*, carved by Jorg Synrsten, xv cent., 15 pl., fol., Wien, 1851.

WOOD CELLAR or woodhouse (Fr. *bûcher*). Wood should never be kept in any large quantity under the same roof with the main house; but in an outhouse to contain the supplies of small wood for fire-lighting; and placed so as to be readily accessible from the offices. Where much is used, wood is stacked elsewhere and brought from thence and placed under cover as required for splitting up. **WOOD YARD.** KERR, *Gentleman's House*, 8vo., 3rd edit., 1871, p. 242. 5. 25.

WOOD DUST. Rotten wood dust is very inflammable.

WOODGATE (...), of Dublin, designed 1810 the county infirmary at Londonderry, cost £7,700, erected by E. Edgar.

WOODWORK.



CARVED WORK ON BENCHES,
S^T MARYS CHURCH,
LUBECK



WOOD LAGGING. The thin lining around the sheet iron covering of a locomotive boiler to keep in the heat, which though rising to 370° Fahr. does not fire it. **LAGGING.**

WOOD NOG. See **NOGGING.**

WOOD PAVING. A pavement formed of wood blocks. This system was borrowed from Russia, by England and America. The *Travels of Sir Anthony Sherrie*, published in 1601, mentions the "streetes of Musco" as "being paved with square peeces of timber sette close one by another". It has been stated that the inventor was John Hosking of Gateshead-on-Tyne, who drew the plans and superintended the high level bridge across the river Tyne for Robert Stephenson, and patented the system, which fell into disuse. Many patents have been taken out since 1839, when blocks were laid down in Whitehall and failed in a week. Now, blocks of yellow fir, well seasoned, and sometimes immersed in one of the solutions for the prevention of rot, are laid close together with the grain vertical, on concrete 6 ins. thick, if the bottoming be itself not firm; a thin layer of fine gravel is spread over the surface before the road is thrown open to vehicles. If wet gets below the blocks, as when they are reduced in thickness by much wear, and frost ensues, the pavement is broken up. It lasts for about five to seven years in heavy traffic or narrow roads; for twelve years in many busy streets. The wear and tear of this sort of pavement is often less than that of stone, but its cost is greater. **JARRAH** from Australia has been introduced since about 1889, and promises well, but still wears into grooves with great traffic in narrow roads. Wood should be laid only in streets with a moderate amount of traffic, and plenty of sun and air; in confined spaces such as courts, it becomes a source of unhealthiness. It had been maintained that if all London roadways had wood pavements, marsh fever or ague would become prevalent. It should be well cleansed, for otherwise it retains all sorts of organic filth; this point was referred to in Haywood's report of 1874. The system has the advantage of diminished noise from traffic. **WILLCOCKS**, *Roads and Roadways*, at **CIVIL AND MECH. ENG. SOCIETY**, in *BUILDER Journal*, 1879, xxxvii, 681, 720; *idem*, 1872, xxx, 810, and xxxi, 633. **RAWLINSON**, communication to *BUILDER Journal*, 1882, xlii, 127, 238, 297, giving his opinion of the requisites for a good form of wood paving. The **CIVIL ENGINEER**, etc., *Journal* for 1838-45 relates the early experiments in Oxford street and in America; and the *BUILDER Journal*, 1872-7, in Bartholomew lane, Ludgate hill, and later. **HOPE**, *Wood Paving*, read before **ROYAL SCOTTISH SOCIETY OF ARTS**, printed in **MURDIE**, *Surveyor, Eng., and Arch. Journal*, 4to., 1843, iv, 369. **ALIGEMEINE BAUZEITUNG**, 1842, pl. 486.

WOOD PIPE. See **WATER.**

WOODWORK. This term includes two kinds of work, viz., carpenter's and joiner's work. The former is the rough framing to the roof, floors and portions pertaining to the skeleton or carcass of a building, and the latter to the fittings and internal work generally. The timber for carpenter's work usually is fir, commonly called "red deal", of which the best is Memel, Riga or Dantzic, and Red American (not pitch) pine logs. Large quantities of Swedish timber are imported and used, but unless previously immersed in one of the chemical solutions now in use, it is liable to decay, and is inferior in strength to those before named. Where oak is required, it should be of English growth and well seasoned, or it is liable to decay, or otherwise deteriorate, especially if painted, which treatment prevents the tannic acid from exuding. Examination of old buildings will show that when oak was used, it was in, as nearly as might be, its natural state; the appearance also denotes that it was frequently used in a green condition, and consequently became bent and twisted; in many cases, however, where the shape is most perfect, traces of previous use may be noticed. **TIMBER ARCHITECTURE**, **CARPENTRY**.

Joiner's work is prepared from "deals", 7, 9, and 11 ins. wide and from 2½ ins. to 3 ins. thick; the best for this purpose are Peters-

burg, Onega, and Christiania; Swedish deals should not be used for framing, as the work invariably twists in a short space of time. Much care is required with boarded floors; they should have a long and careful seasoning, and the joints should not be planed just before laying, as, however old and dry the boards may be, a shrinkage will invariably occur. Early writers have recommended that the boards should be laid down loose for a year, and then be permanently laid; but now the desiccating process can be applied, and if at once laid down without exposure to damp a perfectly close joint may be maintained. The oak most suitable is Riga or Memel wainscot, which makes good framing for all purposes. Mahogany, both Baywood and Spanish, is most used; the latter is the hardest and most valuable, and has generally a beautiful grain, more or less figured. Pitch pine is often used for joiner's work, and the surface polished to show the natural grain, which is strongly marked, being very resinous, but pitch pine is very liable to crack and twist, and is highly inflammable.

S. J. B.

WOODWORKING OR CUTTING MACHINERY. The conversion of wood by means of toothed instruments which saw, tear away, or remove a portion of its substance; and also which divide wood by knife-like or sharp edged instruments, without much waste of material. **MOULDING MACHINE.** **PLANE.** **SAW BENCH.** **SAW MILL.** **VENEER.** **BALF**, *Woodw. Machinery, its Rise and Progress*, etc., 8vo., 1881; 1885. **J. RICHARDS**, *Treatise on the Construction and Operation of W. W. M.*, 4to., 1872: *Arrangement, Care, and Operation of Wood Working Factories and Machinery; an operator's handbook*, 8vo., 1873: *The Economy of Workshop Manipulation*, 8vo., 1876: *Wood Conversion by Machinery*, 8vo., 1886: *The Operator's Handbook of W. W. M.*, 8vo., 188. **UNWIN**, *Exercises in W. W. for Handicraft Classes in Schools*, fol., pl., 1887. **RANSOME**, *How to select W. W. M.*, 1889. "Timber Wood and Working Machinery" *Journal*, 1887. "The Timber Trades Journal", fol., from 1876. 14.

WOOD YARD (Fr. *cour au bois*). A place for stacking wood for the service of a mansion, either by faggots or lumps; it is generally attached to a farmhouse.

WOODS (JOSEPH), F.S.A., F.L.S., F.G.S., born August 24 1776, at Stoke Newington, became a pupil of W. Alexander, and commenced practice about 1800; was one of the founders in 1806 and perhaps first president of the "London Architectural Society", and for their "Essays", 8vo., 1808 and 1810, he wrote *The Situations and Arrangements of Villas; Dilapidations; and Modern Theories of Taste*. He exhibited 1801; and 1802 a bridge of one arch over the Thames; 1811 a hospital for lunatics; 1812 the sale rooms; 1814 a palace and public buildings 2,500 feet long from Hungerford stairs to Westminster bridge; and in 1815 the last. In 1811-12 he designed the London Commercial sale rooms, Mincing lane, using the order of the temple of Minerva Polias at Priene on the exterior; a failure of the ironwork in the floor was the cause of his quitting the profession; (elevation in **ACKERMANN**, *Repository of Arts*, 8vo., 1813, p. 300). He edited the 4th or Supplementary volume to **STUART AND REVETT**, *Antiquities of Athens*, fol., 1816; resided abroad 1816-19, and again 1825-6; published the well-known *Letters of an Architect from France, Italy, and Greece*, 2 vols., 4to., 1828; and from his early tastes, *The Tourist's Flora*, 8vo., 1850. He retired to Priory crescent, Southover, Lewes, Sussex, where he died 9 January 1864, aged 87. *Memoirs* in "Sussex Express" newspaper, January 16: **KIPPIST**, in *Linnean Society records*; **DONALDSON**, at **ROY. INST. BRITISH ARCHITECTS**, 18 January; **MARTIN**, in **INST. OF CIVIL ENGINEERS**. *BUILDER Journal*, 1863, xxi, 86, 112; and 1864, xxii, 51, 56.

WOODTHORPE (EDMUND), born in 1812, became a pupil of Philip Hardwick, R.A. His chief works are mercantile premises, and warehouses, industrial and artisans' dwellings; schools, rectories, country residences; and some church restorations. In 1839 he was appointed district surveyor for Limehouse with its adjuncts; 1853 also for the northern division of the city; was surveyor to the company of Girdlers; to the

parish of S. Giles, Cripplegate; and 1853 to the Metropolitan Freehold Lands company at Barnes. He took into partnership his former pupil Fred. Hammond and together executed many extensive works; a complete list is given in *BUILDING NEWS Journal*, liii, 843-4. He died suddenly November 26, 1887, aged nearly 75, and was buried at Headley in Hampshire. His only son Edmund succeeds him. *BUILDER Journal*, 1887, liii, 769, 798.

WOODWARD (BENJAMIN). A native of Ireland, was articled to a civil engineer, but became a self-taught architect. In 1846 he was associated with sir Thomas Deane of Cork in the Queen's college at Cork, finished 1848; then Killarney lunatic asylum; in 1853 these two, with Deane's son as partners, settled in Dublin, and designed there the new library of Trinity college; the museum at Oxford from 1854, and the university reading rooms; obtained the fourth premium in the competition for the Government offices in 1857; and, the last work of the firm, designed the Kildare street club at Dublin; all in a medieval style influenced by the writings of John Ruskin. He contributed some sketches to an early volume of the *BUILDER Journal* (xix, 436). Returning homeward from a trip for his health, he died June ..., 1861, aged 46. *DUBLIN BUILDER Journal*, 1861, iii, 543, 563.

WOODWARD (RICHARD), clerk of the honor and castle of Windsor while 1555 the conveying water from Blackmore park to the castle was partially completed; John Puncherdon, serjeant plumer; John Norys, esq., controller of the said honor and castle; and R. W., clerk of the same, having the oversight and payment of the works: the expenses are named in *TIGHE AND DAVIS, Annals of Windsor*, 8vo., 1858, p. 600-3. He was also 1556-8 engaged on the building of the "Almes Knights lodgings" with Richard Amice or Amys as surveyor; *idem*, 605.

WOOL HALL. A building erected for the sale of rough and undressed woollens; was established at Leeds, Halifax, Bradford, Huddersfield, and other large towns: and also called "cloth hall". Each hall is divided into long walks or galleries consisting of two rows of stands each of which is marked with the name of the person by whom it is occupied; on these stands the cloth is exposed for sale, and the hall was usually open for about an hour and a half.

There were two cloth halls at Leeds, one for the sale of "mixed cloth" containing 1,800 stands, and one for the white cloth containing 1,200 stands; the first was 364 ft. long by 192 ft. wide, the court 330 ft. by 96 ft.; its windows were 12 ft. by 6 ft. and door 5 ft. by 10 ft.: a rare plate of it in the British Museum, the king's maps, states it was designed and built 1756-8 by John Moxson; it was pulled down for local improvements in 1889. In the north and south of Wales, a market was held at Shrewsbury: at Welshpool a flannel market was held once a fortnight. At Rouen, 200 ft. Fr. long; *BRITTON, Normandy*, 4to., 1828, p. 25; at Ypres; at Barcelona, the *Hala* or *Halle des draps*, 1444, belongs since 1652 to the crown, used by the viceroys, considerably altered by count Roncali, and since 1845 was restored as the *palacio de la reina*. The greater part of the wool market at Cracow was burnt 1555, when it was restored in the style of the renaissance by "John of Padua, invited to England by Henry VIII": *ILLUSTRATED ENGLISH MAGAZINE*, Nov. 1889, p. 104.

WOOLPACK or **WOOLSACK.** Traditionally this material has been used in forming foundations of buildings. At the temple to Diana at Ephesus, "Ctesiphon first made a bottom of coals, pounded to dust, then drove in piles with fleeces and coals wedged in between the piles, and over these a course of stone with very large junctures"; *ELMES, Dictionary of the Fine Arts*, 8vo., 1826, s. v. Foundation. Boston church, Lincolnshire, built on woolsacks, wool at that time being the source of the wealth of the town; *ASSOCIATED SOCIETIES, Reports and Papers*, 8vo., 1870, p. 179. The "extraordinary good parsonage house (at Sheere in Surrey) of old timber building, encompass'd about with a large and deep mote—was built on woolpacks in the same

manner as our Lady's church at Salisbury was; that is, it is like enough some tax might be laid on woolpacks towards the building of it"; *AUBREY, Surrey*, 8vo., 1718, iv, 42. It has been a common saying that the foundation of old London bridge was laid upon woolpacks, owing its origin to tax upon wool granted by king Henry II towards its erection. From the surveys made during the removal of one pier to widen the centre arch, it was discovered that the piers were erected on frames of piles, on the tops of which were laid long planks of timber, ten inches thick, strongly bolted; on the outside of this timber foundation are the piles, called the starlings. The lowermost layers of stones in the piers were laid in pitch, instead of mortar; *NOORTHOUCK, Hist. of London*, etc., 4to., 1773. *LELAND* relates that the piers of Wade bridge in Cornwall were laid on packs of wool, on the quicksands.

WOOL WAREHOUSE of the London Docks; section, etc., by J. Sineaton, in *MURIE, Surveyor, Eng., and Architect, Journal*, 4to., 1840, i, 137.

WOOLFE (JOHN), of a family of high respectability in the county of Kildare, in Ireland; between 1715 and 1775 he was clerk of the works at the tower of London; 1726 at Richmond and Kew, *cir.* 1770 labourer in trust at Westminster at 2s. per day; 1775 at Whitehall, S. James's, and Westminster at "about £54 per quarter"; and 1774-5 only, at the mews at Charing Cross, all in the office of the Board of Works; in about 1765 he was residing in Scotland yard; and at that time J. Gandon applied to him to assist him in the publication of the two volumes of the *VITRUVIUS BRITANNICUS*, fol., 1767 and 1771. Heythorp or Heythrop, Oxfordshire, for the earl of Shrewsbury, 1789, is attributed to him, and also to T. Archer, *cir.* 1705; *Vit. Britt.*, ii, pl. 82-5; and *NEALE, Seats*, 4to., 1822, iii. *MULVANY, Life of Gandon*, 8vo., Dublin, 1846, p. 17-8. The plate of the cloth hall at Leeds, above-mentioned, is inscribed "J. Woolfe, sculp. York". 3.

A John Woolfe junr., in 1781 exhibited a "temple of Victory" at the royal academy; and succeeded Jason Harris as clerk of the works at Whitehall, etc. Possibly the above entry of 1770 may apply to the son.

WOOLPIT BRICK; from near Bury S. Edmunds, Suffolk. The clay furnishes some of the best white and red bricks in England; they can be molded into ornamental forms and stand the weather well. **WHITE BRICK.**

WOOLRYCH (JOHN), or **Wulrich;** see **WOLRICH (J.).**

WOOTZ. Indian steel. *OLIPHANT, Katmandu*, 8vo., 1852, p. 174.

WORCESTER (Sax. *Wigra ceastre*). A town in the county of the same name in England, situated on the river Severn, crossed by a stone bridge, 1313, rebuilt 1771-80 by J. Gwynn, R.A. The castle was built shortly after the conquest; of it, a square fort called Edgar tower, *cir.* 1200, *temp.* king John, is all that remains, and now used as diocesan registry. There were six city gates besides the tower to the bridge, the last of which was taken down 1787; *State of the Walls*, etc., in 1768, *Journal of the ARCHAEOLOGICAL ASSOCIATION*, 8vo., 1849, iv, 271. Fort Royal, of king Charles's time, near the commandery to the south-east, is described in *ASSOCIATED SOCIETIES, Reports and Papers*, 1879, p. 60. The streets intersect at right angles, in which are some half-timbered and gabled houses. A house 1651 but modernised. The mansion of the Windsor family, now Flight and Baris porcelain works, has some good Elizabethan chimney-pieces; *GENTLEMAN'S MAGAZINE*, 1837, p. 483.

The bishopric was founded 679. The cathedral dedicated to the virgin and S. Peter, was built 983, burnt, rebuilt 1084-95 by bishop Wulfstan, burnt 1113 and 1149; the tower fell in 1175, again burnt 1202 and reconsecrated January 1218. The crypt under the choir remains of Wulfstan's edifice (it appears to have extended more northwards, *BUILDER Journal*, 1861, xix, 586); its semi east end with small columns and cushion caps are like those at Gloucester; there are many other small portions of the Norman period. From 1224 the choir (Early

English) foundations laid by bishop William de Blois (died 1236), the retro-choir, east transepts, lady chapel, chapels, and groined vaulting were built (B. J., 1857, xv, 559, restorations; 1863, xxi, 672-3; 1870, xxviii, 792). Two bays of the nave are transition Norman; west transepts (no aisles) altered in XIII cent. The nave has nine bays (Decorated); the vaulting of north aisle 1317; the nave 1377; it is 170 ft. long, 30 ft. wide, or 78 ft. with aisles, and 68 ft. high. The rich central tower 1374 is 196 ft. high. North porch 1375-95, with alteration of west end of nave. Windows filled in with Perpendicular work. New west window 1789 and east window 1792, both by T. Johnson. The pavement dates 1748. The clocherium taken down 1647. The spirelets outside were fourteen in 1764, but in 1852 only two remained. The Italian choir screen 1812, has been removed for an altar screen with retables of alabaster, etc., 1874 by sir G. G. Scott, B. J., xxxii, 228; view 370. Stone pulpit of late Perpendicular work; stalls restored; new bishop's throne of oak; nave pulpit by J. Forsyth of London, designed by sir G. G. Scott 1873. The north doors XIV cent. were 1820 removed into the crypt. The monumental chapel to prince Arthur, died 1502, a son of Henry VII, and king John's tomb, have been restored by the government. Bells and carillon machine, given in B. J., 1874, xxxii, plan 238-9. The total size of the building is 425 ft. by 145 ft.; the west transepts 128 ft. long, 32 ft. wide, and 66 ft. high; the east transepts 120 ft. long. The proportions of the cathedral are given in GREEN, i, 48; in STORER AND GREIG, sig. k. Stone used by the Norman and Early English builders was from the Higley sandstone quarries near Bridgenorth; for Perpendicular work from Holt; works after 1857 from Ombersley near Droitwich: after 1860, sandstone from Hadley with Bath weatherstone. The Blockley quarries near the city are described in B. J., 1862, xx, 897a.

Restoration and rebuilding commenced 1857-63 of the eastern portion, south side round to the north, cloisters, and chapter-room; the interior begun 1862-3 in cleaning, etc., and groining to choir, all work up to 1876 being done under A. E. Perkins, architect to the dean and chapter. The cathedral was reopened 5th April 1874; the total cost to 1881 was £130,000. BUILDER JOURNAL, xv, 559, 562, 606, 624, 660; xvii, 76; xx, 879; xxi, 661. Some old work discovered, is described *idem*, 1861, xix, 236. ASSOCIATED SOCIETIES, *Reports and Papers*, 1873-4, p. 1.

GREEN, *Discovery of the Body of King John*, 4to., 1797. FAIRHOLT, *Monumental Effigies prior to King John*, B. J., 1848, vi, 398. BLOXAM, *Sepul. Remains and Monuments*, in GENTLEMAN'S MAGAZINE, 1862.

The cloisters about 120 ft. square with lavatory in west walk are *cir.* 1380, restored 1866. Near the north porch in 1866 was discovered the vaulting of the charnel house, built *cir.* 1224 by bishop W. de Blois, the chapel over it was destroyed in XVII cent.; this vault was destroyed to lower the ground. The chapter-house is transition Norman with the upper part Perpendicular work, decagon outside and circular within, 58 ft. diameter, its fine vaulting carried by a plain central shaft; it is used as the cathedral library and has been restored. The priory or deanery was used as the bishop's palace until 1842, pulled down 1845; the section of roof of the hall, 55 ft. long, and 12 ft. high to the tiebeam is shown in B. J., 1848, vi, 234. The famed "guesten hall", begun about 1320, was completed much later; it was 65 ft. long, 34 ft. wide, and 45 ft. high to the collar beam; report on the state of the roof by E. Christian, B. J., 1860, xviii, 471; the greater part was pulled down 1860-62 and roof given to a proposed new church; PARKER, in GENTLEMAN'S MAGAZINE, Sept. and Oct. 1862; B. J., xx, 701; ASSOCIATED SOCIETIES, *Reports and Papers*, 1854, p. 145-50. The college schools, XIII cent., hall 120 ft. by 38 ft., was the refectory of this Benedictine monastery.

ABINGDON, *Cath. Ch. of Worc., Chichester, and Lichfield*, 8vo., ARCH. PUB. SOC.

1717. THOMAS, *Survey of Cathedral*, 4to., 1736. WILLIS, *Survey of Cathedral*, 4to., 1727-30. BENTHAM, *History of Gothic and Saxon Architecture*, fol., 1798. STORER AND GREIG, *Cath. of Great Britain*, 8vo., 1814-9. WILD, *Illustrations*, 4to., 12 pl., 1819; 1823. BRITTON, *Cath.*, 4to., 1835. WINKLES, *Cath. of Great Britain*, 8vo., 1836-8. ASHPITEL, *The Cathedral*, in B. J., 1848, vi, 410; and JOURNAL OF THE ARCHAEOLOGICAL ASSOCIATION, 1848-9, iv, 288, 319 plan. WALKER, *Churches of Worc.*, B. N. J., 1858, iv, 1010; also in ASSOCIATED SOCIETIES, *Reports and Papers*, 1857-8, iv, 323-49, with illustrations; and 1865-6, viii, p. xliii. Worcester Congress of the Archaeological Institute, B. J., 1862, xx, 544. WILLIS, *Arch. History of the Cathedral and Monastery*, in ARCHÆOLOGICAL JOURNAL, 1868, xx, 83, 255, 301. WILLIS, *Crypt and Chapter House*, at ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 20 April 1863. NOAKE, *The Monastery and Cathedral*, 8vo., 1866, being a description by prior Moore 1488-1535; reviewed in B. J., 1866, xxiv, 790-2; also in ASSOC. SOCIETIES, *Reports and Papers*, 1860, cxxix. KING, *The Cathedral*, 8vo. (Murray), 1867. ALDIS, *Carvings and Sculptures*, 69 photos, 1873. CREIGHTON, *The Italian Bishops preceding the Reformation*, in ASSOC. SOCS., R. and P., 1889, xli, and 94-118.

The churches are built of a soft and commonly reddish sandstone. S. John Bedwardine has eleven gables, is Norman and third pointed, with a square Perpendicular tower; a south porch 1840; B. J., 1848, view vi, 397, 402; new aisle of Ombersley stone 1861, xix, 900. S. Albans, Norman, restored 1850 by A. E. Perkins. S. Helen, XIII cent., tower rebuilt 1813 or 1820; *Reports and Papers*, 1878, p. 287. S. Andrew, late; tower 90 ft. high, spire added 1733 by N. Wilkinson, 155 ft. 6 ins. high, 20 ft. diam. at base, 6½ inches at top. S. Martin, 1772 by A. Keck; 1855-62 modernised by W. J. Hopkins, B. J., xx, 376. The three churches of S. Nicholas, lofty campanile repaired 1867, S. Swichin, and All Saints, were designed 1728-42 by T. White. S. Clement 1823-4; S. George rebuilt 1830, and S. Peter built 1838; the foundations of the last were found defective 1858, B. J., xvi, 583. S. Paul 1836, and (old S. Michael near the cathedral pulled down 1842) the new S. Michael Bedwardine rebuilt 1842 by H. Eginton. Holy Trinity, 1865 by W. J. Hopkins, has the roof of the guesten hall reused but lessened 4 ft. in width; BUILDER NEWS JOURNAL, 1865, xii, 654, 670; and xxiii, 469; ASSOC. SOCIETIES, *Reports and Papers*, 1865-6, p. xlv. There are numerous other churches and chapels; among them the Angel street congregational chapel, 1858-9 by Poulton and Woodman of Reading; B. J., xvi, 296; xvii, 413; and B. N. J., v, 567. Whittington schools, S. Peter's, 1857 by R. W. Armstrong; B. N. J., iii, 826. The cemetery 1858 by R. Clarke of Nottingham, £4,830; B. J., xvi, 680; and B. N. J., iv, 1227.

The shire hall (Ionic) 1834-5 by C. Day. Town or guildhall 1721-3 by T. White, a pupil of sir C. Wren; lower rooms 110 ft. by 25 ft.; 1876 to be preserved, B. J., xxxiv, 470, 814 plan by sir G. G. Scott, B. J., xxxv, 273, 723, cost £11,500; 1879 under restoration by H. Rowe, city architect. County and city jails, new county prison by Nat. Wilkinson (died 1815); extension *cir.* 1845 by H. Eginton; and 1857 by H. Rowe, B. J., xv, 455; and 1868, xxviii, 792. County infirmary, *cir.* 1772 by A. Keck; alterations *cir.* 1855 by A. J. Hopkins. Lunatic asylum, 1861 new wing for 100 patients, cost £4,500. Theatre 1875-8 by C. J. Phipps for 1,500. Public library and Hastings museum, by R. K. Freeman of Bolton; B. J., 1881, xi, 355. The convent of "The White Ladies", ruined chapel and crypt 1255; ASSOCIATED SOCIETIES, *Reports and Papers*, 1865-6, p. 355-64. Commandery founded by bishop Wulfstan, as hospital for travellers, rebuilt *temp.* Henry VIII; the house, great hall with its roof, minstrels' gallery, coved canopy over the dais, oriel window, and solar or lords' rooms, remain; it is now the college for blind sons of gentlemen. An exhibition by native artists was opened 1818 with 175 works; CHAMBERS, *History*; and ACKERMANN, *Repository of Arts*, 8vo., 1819, vii, 121. Three large market

halls, and two corn exchanges erected before 1848. Worcester Old Bank, modernised 1860 by John Billing of Westminster, B. J., xvii, 479. Worcester city and county new banking premises, 1859-62 by E. W. Elmslie of Malvern, cost £8,299; Blockley quarry stone used, B. J., xx, 897. House of industry 1793-4 by G. Byfield of London (GREEN, ii, 13). New police station 1862, H. Rowe; B. J., xx, 537.

Chronicle of Florence of Worcester, Annales Ecclesie Wygorniensis, early XIV cent. GREEN, *Survey of the City*, 8vo., Worc., 1764. PRICE, *Worc. Guide*, 8vo., 1799. *Worcester and its Vicinity*, 12mo., Worc., 1806. NOAKE, *Worc. in Olden Times*, 1849; *Antiquarian Ramble through Worc. Streets*, in ASSOC. SOCIETIES, *Reports and Papers*, 1887, p. 140. NOTES AND QUERIES for Worcester, 1856. *Worcester Volume of the British Archaeological Association*, 8vo., 1851. FLORENCE, *Stranger's Guide*, 12mo., 1828. NASH, *Worcestershire*, fol., London, 1782. CHAMBERS, *Biography of Worcester*, 8vo., Worc., 1820, p. 567. DEIGHTON, *Guide to the City*, 188. BUILDER *Journal*, 1863, xxi, 411. EATON, *New Stranger's Guide*, 12mo., 1863. 1. 14. 28. 50. 96.

WORCESTER (EDNOTH OF), a monk who superintended the building of the church and offices of Ramsey abbey, Huntingdonshire, the former of which was completed in 974. BRITTON, *Arch. Antiq.*, 4to., 1826, v, 126, quoting GALE, *Quin. Script.*, *Hist. Ramseiens*, cap. xx. 19.

WORCESTER (ALDRED), bishop of Worcester 1089, built the nave of the cathedral at Gloucester.

WORCESTER (WULFSTAN OF). See WULFSTAN.

WORK. The result of the labours of the workman, artificer, artisan, labourer, or skilled practitioner in all trades, arts or sciences. The statute 1360, 34 Edward III, c. 9, added the clause "For every lord or other make bargain or covenant of their work in gross", to the 23 Edward III, 1349, and 25 Ed. III, 1350; all repealed by 5 Elizabeth, c. 4. WAGES, the price paid for labour. WORKMAN. 1. 15. 25.

WORKHOUSE (Lat. *sophronisterium*, or house of correction; It. *casa di misericordia*, or hospital). At first the building appears to have frequently combined the character of a bridewell. The building at Hamburg, one of the oldest institutions of the kind in Europe, is still called the correction and poor-house. Edward VI, 1547, cap. 3, and 1549, cap. 16, provided hospitals for the poor by impotency and the poor by casualty, while bridewell was allotted to the thriftless poor. A great object of 43 Elizabeth, 1601, cap. 2, the foundation of the present poor laws, was to provide employment for the destitute, and in some places it was styled the house of industry, and "houses of dwelling for the impotent poor". PECK, *Desiderata Curiosa*, 4to., 1779, i, 126-8, mentions in 1582 proposals to erect general workhouses for Lancashire and Cheshire, and another at Manchester. The first hospital or workhouse in England was built 1618 at Dorchester: London followed, under the statute of 13 and 14 Charles II, 1661-3; Bristol 1696-8, and Worcester, 1703-4; and generally by 9 George I, cap. 1, 1722-3; also Gilbert's Act 1782, 22 George III, cap. 83. The Commissioners of the Poor Law inquiry 1834, recommended parishes to unite for better workhouse management; this is the origin of poor-law unions.

In 1836 was built the workhouse at Abingdon, Berkshire, designed by S. Kempthorne, being the first completed under the provisions of the poor law amendment act, at a cost of £8,500; COMPANION TO THE ALMANACK, 1836. In their first report, fol., 1835 are ten plans and elevations prepared by him; and in second report, 1836 is another. R. P. BROWNE, *Greenwich Union Poorhouse*, in WEALE, *Quarterly Papers on Arch.*, 4to., 1843-5, i, with plates, for 1,200 inmates, at a cost of £28,000, being an average of £24 including land and drainage. These early buildings were nicknamed "bastilles". The plan and elevation of the Union workhouse at Old Basing, is given in *The Apprentice, etc., Journal*, 4to., March 1844, p. 52-3. The Andover Union workhouse is shown in ILLUSTRATED LONDON NEWS, 1846, ix, 304; with one better designed for Canterbury by Mr. Parker,

ex-ass. comr. who had designed the one at Aylesbury. In 1850 the Glasgow Barony parish poor's house at Barn-hill, formed when completed the largest inhabitable building in Scotland; 320 ft. long and 300 ft. deep; the chapel to hold 1,500 people; for 2,000 inmates; the grounds and buildings cost about £25,000; ARCHITECT *Journal*, 1850, ii, 500. In 1867 a committee of physicians reported that it was requisite to have not less than 850 cubic feet on an average with a clear space of 6 ft. across each bed for the sick; for offensive cases 1,200 ft.; chronic and infirm cases, for day and night use, 500 ft.; for healthy adults and children in wards and at night only 300 ft. At Marylebone workhouse, 780 cubic ft. was allowed, BUILDING NEWS *Journal*, 1869, xvii, 314. POORHOUSE. SPITAL. UNION WORKHOUSE. 14. The infirmary or hospital should be a detached building, with not less than 1,000, and in particular classes of cases 1,200 to 1,500 cubic feet of air for each patient; also dayrooms for the aged and infirm, the chronically sick, and the convalescent. The Lancet Sanitary Commission for Investigating the State of the Infirmary of Workhouses, etc., 1866.

Account of the Workhouses in Great Britain in 1732, showing their origin and management, 8vo., 1786, 3rd edit. FARRE, *Reports on Workhouses*, 8vo., 1850. T. D. BARRY, *Union Workhouses*, in LIVERPOOL ARCHITECTURAL, ETC. SOCIETY, *Proceedings*, 4to., 1851-2, ii, 165. SNELL, *Charitable and Parochial Establishments*, fol., 1831. BUILDER, BUILDING NEWS, ARCHITECT and BRITISH ARCHITECT *Journals*, *passim*. *Metropolitan Workhouses and their Inmates*, 8vo., 1857.

WORKING DRAWINGS. The preparatory work for the proper construction of a building, often for obtaining an estimate in the first instance, and then for carrying out the various trades in accordance with the design or intention of the architect or artist, as well as for furniture, decoration, metal, and other similar works. Such drawings for the larger purpose consist of plans, elevations, sections, details of construction, with others of the outline of mouldings, many being to the full size. These are usually tinted according to the materials to render them more obvious to the tradesman for whose use the drawings are made. Dimensions of materials should be constantly borne in mind, especially of brickwork. A correct survey of the site, with cross-sections from actual levelling, are indispensable preliminaries, and will save many a blunder as regards plan, elevation, and section, and the necessity for altering drawings during execution. CONTRACT. DESIGN. DRAWING. MODEL. MOULD. PATTERN. PICTURE. PLAN. PLOT. PROJECTION. TEMPLATE.

DOBSON, *Student's Guide*, 8vo., 1843. A. HAY, *Modern Builder's Guide*, a series of practical drawings on architectural subjects, 4to., and 156 pl. fol., 2 vols., 1840. WALKER, *Essay*, in DAVY, *Architectural Practice*, 8vo., 1841. DENTSEY, *Builder's Guide*, 8vo., 1851, Suppl., 65 illust. LAXTON, *Examples of Building Construction*, lar. fol., 1855-58. BUNKER, *Practical Hints*, read at Architectural Association; BUILDING NEWS *Journal*, 1859, v, 1124. BURGESS, *Architectural Drawing*, at Roy. Inst. of Brit. Architects, *Sessional Papers*, 1859-60, p. 181; and *Architectural Drawings*, measured examples, fol., 1870. BURN, *A Series of Working Drawings and Designs*, with essays, 55 pl., fol., 1865; and *Working Drawings and Designs in Mechanical Engineering and Machine Making*, with essays, 56 pl., fol. "A System of colouring the several parts of drawings", in BUILDING NEWS *Journal*, 1869, xvii, 280.

WORKING LOAD. See SHEARING and TEARING.

WORKMAN. A skilled artisan or artificer, working by his hands, in contradistinction to the labourer or labouring man, unskilled. The history has not been written; some details are given herein, s. v. the various trades; also OPERARIUS, EFFIGY, FREEMASON, LODGE, GILD, TOWN, MONK, WAGES, LABOURER, GLASS (p. 45 b). DALLAWAY, *Discourses*, 8vo., 1833, p. 401-2; HAWKINS, *History*, 8vo., 1813, p. 53-8. GOULD, *History of Freemasonry*, 4to., 1882. BENTHAM, *Essay on Gothic Arch.*, 8vo., 1800, p. 39. SURTEES SOCIETY, *Fabrick Rolls of York Minster*, 8vo., Durham,

1859. WILLIS AND CLARK, *Arch. Hist.—of Cambridge*, 4to, Camb., 1886, i, 378, 381; ii, 256, 444, 452; iii, 623. VASARI, *Lives of Artists*, etc. MONTEIL ET RABUTEAU, *Corporations de Métiers*, in LACROIX ET SERÉ, *Le Moyen Age et la Renaissance*, 4to, Paris, 1850, iii; and SERÉ, *Hist. des Corporations Ouvrières*, 8vo., Paris, 1845-53. 4.

Among the workmen employed early in XIII cent., the *cementarii* or masons were separated into classes; they were cutters and sculptors of freestone (London assize of 1212), *leggers* or layers, and setters; they worked either by the piece, *ad tascham*, or at fixed daily wages, with an extra allowance in some cases, as *metesilver*, but at the highest fixed rate of daily pay, no "metesilver" or corrody was given. There were plasterers and whitewashers, mud stickers, *luti appositores*, who filled up between the stud work, excavators and barrowmen. In extensive buildings they worked in gangs, each of about twenty men under a *vintennarius* or foreman; TURNER, *Dom. Arch.*, 8vo., 1851, i, xxviii. In 1307 master Richard de Wightham, the mason assigned by the treasurer to the controllers of the work, received 7s. per week, to superintend and direct each of the works of building, and to be the master in the same office at the palace of Westminster and the tower of London; and under him was master James de Leuesham, the workman appointed to oversee the several operations of workmanship in those places: a few years later (1319), the best masons and carpenters received 3s. 6d. per week; in 1330, 2s. 6d.; and master Thomas of Canterbury, "*intrinsece super moldas operanti*", had 6s. per week, or as much as the clerics *operacionum*, if the latter had not been paid for every day in the year. In 1350 and 1360, the chief painters, glaziers, masons, and carpenters, received the same wages of 6s. per week; so much was the payment to Henry de Yeveley, mason, director of the works (*magister operum*), while the *apparator operantium* of the masons, as well as the *apparator operantium et ordinator* of the carpenters' work, received 3s. and 4s. In the preceding century (1291) the weekly wages of the *apparator* were 3s. 6d., while the principal painters of history received 12 and 14 pence per day; BRITTON and BRAYLEY, *Ancient Palace of Westminster*, 8vo., 1836, p. 110, 121. After the fire of 1370 at S. Patrick's cathedral, Dublin, sixty straggling idle fellows were taken up and obliged to assist in repairing the church and building the steeple; it is presumed that they were supported while employed at the building, and when completed, they returned to begging, for which in 1376 they were banished the diocese. This mode of employing and relieving the poor throws some light on the cheap method of erecting churches in those days; BELL, *Origin and Progress of Gothic Architecture in Ireland*, 8vo., Dublin, 1828, p. 163.

Workmen were at times pressed into the service of the monarch, whenever the royal works required their services; and a grant made to a favourite that the men employed by him should not be disturbed. The following affords one example:—1350-1, 24 Edward III, John de Sponlee was appointed master of the stonehewers at Windsor Castle, with a power not only to take and keep as well within the liberties as without as many masons and other artificers as were necessary and to convey them to Windsor, but to arrest and imprison such as should disobey or refuse; with a command to all sheriffs, mayors, bailiffs, etc., to assist him. W. of Wykeham had like powers granted to him; these were fully acted upon at a later period when some of the workmen, having left their employment, were thrown into Newgate; while the places of others, who had been carried off by a pestilence then raging in the castle, were supplied by imprisonment. This privilege for the mint was not discontinued in the reign of Elizabeth. No younger brothers were to betake themselves to trade, but were churchmen or retainers to great men. AUBREY, in *Antiquarian Repertory*, 8vo., 1807, i, 73. Handicraftsmen were allowed to work in towns where they were not free; 1548-50, 2 and 3 Edward VI, ch. 15, §4; repealed by 1549-51, §3, and 4 Edward VI, ch. 20, §3; not permitted to exercise any other trade than that to which they had been apprenticed,

1562-3, 5th Elizabeth; repealed 1814 by 54th George III. The laws of "Forriners" or non freemen, are recorded 1573 in JUPP, *Carpenters' Company*, edit. by Pocock, 8vo., 1887, p. 369, 508; and as to supplanting workmen, *idem*, 379. 25.

Representations of early date of the trades are found in the church at Calverton, Nottinghamshire; the Cottonian MS., B. 4. Nero D. 1; 19 D. ij, fol. 68b: Harleian 2278, fol. 28b: Harl., 4374: others shown in STRUTT, *Manners and Customs*, etc., 4to., 1775-6; i, pl. 7, 8, 13, 32, 65; ii, pl. 4; on a suit of armour, temp. Henry VIII, in ARCHEOLOGIA, 1829, xxii, 112, pl. 16-7. In High Wycombe church, Bucks; the labels of one window. In Ely cathedral, the two labels of the north-west arch of the tower present the heads of the architect and master mason. The master mason, supervisor, and paymaster, in the glass at Winchester college. More modern examples are the bust of the contractor of the Law courts, with the bust of the architect (G. E. Street by his side; and the statue of the latter in the great hall there: the statue of sir C. Barry in the palace of Westminster.

Among examples in other countries:—Piacenza, the tablets over each arch representing the crafts who contributed *cir.* 1132 to the erection of the edifice. At the ducal palace at Venice, the nineteen capitals of trades (RUSKIN, *Stones*, ii, 356-9). Raphael's pupils are shown at work in the loggia of the Vatican at Rome. The square Virgil at the Vatican has two representations. At Reims, in the labyrinth in the pavement (GAILLIABAUD, *Arch. du Vme*, 1858; SOMMERARD, *Les Arts*, etc., ch. viii, pl. 1). At Bourges, in the glass (TURNER, *Dom. Arch.*, 1851, i, 116). At Chartres, in the glass (LASTEYRIE, *Hist. sur Verre*, 1843; BORDIER ET CHARTON, *Hist. de France*, 8vo., 1859, i, 406-8; DIDRON, *Annales Arch.*, 1846, vi, 114, and 1848, viii, 50). Belgium, SERÉ, *Les Arts Somptuaires*, i. VIOLETT-LE-DUC, *Les Ouvriers au XIII Siècle*, in DALY, *Revue Gén.*, 1853, xi, 3-7, and his *Dict. Raisonné*. FONS-MÉLICOCH, *Les Artistes et les Ouvriers du Nord de la France*, etc., 8vo., Béthune, 1848. Crafts of Germany; PENNY MAGAZINE, 1832, i, 55. Work and Workmen in Paris; BUILDER JOURNAL, 1861, xix, 401. Associations of Paris; DALY, *Revue Générale*, 1840, i, 548. French Mediæval Building Trade, BUILDER JOURNAL, 1879, xxxvii, 93, 226. Poitiers, Lists of workmen, 1583; COMITÉ HISTORIQUE, *Bulletin*, 1843, ii, 465. Edinburgh, Working Classes; EDINBURGH NEWS for October 1852.

Hints to Workmen; cautions to painters, glaziers, and plumbers; BUILDER JOURNAL, 1857, xv, 367. SMIRKE, *Condition of Workmen Now and in Early Times*, *idem*, 1849, vii, 146. As to swearing, at S. Paul's cathedral, 25 Sept. 1695; *idem*, 1860, xviii, 765. SCOTT RUSSELL, *Education of Working Men*, *idem*, 1859, xvii, 389. *History of the Middle and Working Classes*, 1859, extract in DUBLIN BUILDER JOURNAL, 1859, i, 159. THACKRAIL, *Effects of the Principal Arts, Trades, and Professions, on Health*, etc., 8vo., Leeds, 1831. DONALDSON AND GLEN, *Specifications, Contracts*, etc., 8vo., 1859, ii, 97, 109, 116. Employers' Liability Act, 1875, c. 90, 1880, 1888, etc.

The earliest mention of the "travelling bodies of freemasons", occurs in AUBREY, *Natural History of Wiltshire*, and appears to have been written a few years before 1686. It states that "sir William Dugdale told me many years since". In WREN, *Parentalia*, fol. 1750, the son records the belief of his father under the expression, "He [Wren] was of opinion." In a similar manner in the memoir of Elias Ashmole in the BIOGRAPHIA BRITANNICA, appears a letter from Dr. Kuipe, of Christ Church, Oxford, expressing "What from Mr. Ashmole's collection I could gather was, that the report of our Society, taking rise from a Bull granted by the pope in the reign of Henry III, to some Italian architects, to travel over all Europe to erect chapels, was ill-founded. Such a Bull there was, and those architects were masons. But this Bull, in the opinion of Ashmole, was confirmative only, and did not by any means create our fraternity [of Freemasons], or even establish it in this kingdom"; GOULD, *History of Freemasonry*, 4to., 1884, iii, 16, 27, 32, 34; which with the articles FREEMASON; MASON; MASTER

OF THE WORKS; BONNEUIL; Wilars de HONECORT: ALBI; give many instances of workmen going from place to place.

WORKMAN'S BRICK. See BRICK; WATERPROOF.

WORKMANSHIP. The result of the labours of a skilled artisan. After 1175 to end of XIII cent., and fifty years later, is noted as the time of good work, by sir G. G. SCOTT, *Lectures*, 8vo., 1879, i, 202-3.

WORKMAN'S HOUSE. A list of publications is given *s. v.* LODGING HOUSE (model), up to 1868. OCTAVIA HILL, *Homes for the London Poor*, 8vo., 1875. CHADWICK, *Workmen's Houses at the Paris Exhibition*, in *ILLUSTRATED LONDON NEWS*, 1867, li, 23-6. FLETCHER, *Model Houses for the Industrial Classes*, 8vo., 1871. GUIDOTTI, *Houses for Working Classes at Florence*, *BUILDER Journal*, 1854, xii, 154, 390-1. Workmen's Lodgings, B. J., 1855, xiii, 543, 843. At Dudley, B. N. J., 1856, ii, 29; 1871, xx, 316. Working Men's Houses at Liverpool, B. N. J., 1865, xii, 594. At Liège, twenty-one houses, £170 each, B. J., 1866, xxv, 616. Labourers' Dwellings, B. N. J., 1868, xv, 4; London Poor, 1870, xviii, 58. Workmen's Cottages in Scotland, B. N. J., 1871, xx, 427: and at Llandaff, for Messrs. C. de Bergue and Co., at a cost of £105 each; B. J., 1866, xxiv, 885. Houses at Vienna, Berlin, and Mulhouse, in *ANNALES DE LA CONSTRUCTION*, fol., Paris, 1856, ii, pl. 33-5; and *Asile Impérial de Vincennes pour 500 ouvriers convalescents*, by Laval; *idem*, 1857, pl. 1-4. At the Hygienic Congress at Bruxelles, 1876 Oct., Dr. Paul of Antwerp read a paper on "Workmen's houses and sanitary house construction" as regarded Belgium.

WORKROOM. A room in a large mansion useful for the purposes of dressmaking, or making up curtains and such like; it may be a women's room or housemaid's room, or ladies' maid's room, and placed near the housekeeper rooms, or on an upper floor near the bedrooms.

WORKSHOP. A room attached to a house, a sort of lumber room, wherein furniture can be repaired and such odd jobs done; also where elder children can be allowed to work, or there be instructed in woodwork, carving, modelling, or turning. Part of a loft, or of an outer building in case of fire might be preferable. For a mansion, a workshop prepared for general purposes, would include a smith's shop, and a shoeing shop, 12 ft. to 14 ft. square, with a forge. Plumber and painter's shop about the same size, with fireplace, bench, shelving, drawers, rack for glass; perhaps also a furnace for melting lead, and its casting table. Carpenter's shop, 12 ft. by 16 ft. to 20 ft.; the usual fireplace or enclosed stove; its proper bench, lathe, shelving, pigeon-holes, nests for nails and screws, drawers for ironmongery under lock, etc. Cabinetmaker's shop, for repairs, upholsterer's work. These may be arranged around an enclosed yard about 20 ft. wide, for holding the stock of timber and deals and any building materials. An open shed will be found useful. All such workshops, except the smith's, might be placed in a loft over stabling; KERR, *Gentleman's House*, 8vo., 1871, 3rd edit., p. 248, 276. An estate workshop for the earl of Derby, near Bury, Lancashire, by James Green, plan and view in *BUILDER Journal*, 1866, xxiv, 506. FARM. RAILWAY.

Builders' shops are rarely high enough to pile long deals up so as to keep them dry and ready for use, nor wide enough to turn a deal to plane it from end to end. "Workshops regulation act", 1867, 30 and 31 Victoria, cap. 146; does not state the cubic space prescribed for each person—300 cubic ft. has been thought expedient—the employers compelled to hang up printed rules in the workshops. Saturday half-holiday compulsory for children, young persons, and women in all factories, workshops and places in which any manual labour is performed; another afternoon may be substituted, and the hours from 7 to 7, or 8 to 8, but labour must cease on Saturday at 2 p.m. COLYER, *Public Institutions*, 4to., 1889, as Mechanics' workshop for trades, Smiths' shop, Carpenters' shop, etc. *The Amateur Mechanic's Workshop—Woods and Metals*, &c., 8vo., 1870. TURBAN, *Les Grandes Usines; études industrielles en France et à l'étranger*, 11 vols., 8vo., Paris, 1863-78.

WORKWOMAN. The following notices have been found of their employment in England. 1265 or 1309, Michael of Kildare's *Poem on the Erection of the Walls of New Ross*, co. Wexford; Harl. MS., No. 913; in *ARCHÆOLOGIA*, 1829, xxii, 307-22, where on the Sunday the ladies of the town all went forth to cast stones and carry them 'from the fossé—carried banners and sang to encourage the workmen (p. 312-3, 319); and 1840, xxviii, 438-41. Workwomen from Creuse in France "are sought by the young men, neither for their beauty nor personal attractions, but because they are good strong workers and careful in the management of the house"; BLACKIE, *Imperial Gazetteer*. 1279, Rockingham castle; in payments to Rosa, the daughter of Alexander the baker, Agnes de Coleville, Avicia Cooke, Avicia the daughter of the plumber, John Scot, Ivota the wife of Adam le chapman, and John Cooke, work-people, moving the earth with shovels and barrows (cum hoccis et civeris) towards the granary, 5s. 3d., each per week 9d.; C. H. HARTSHORNE, in *ARCHÆOLOGICAL Journal*, 1845, i, 356-78, from Roll in Queen's Remembrancer office. 1628-50 building of Heriot's hospital, Edinburgh; "for chains for the women which drew in the carts"; NOTES AND QUERIES *Journal*, 1867, 3 ser., xii, 308. In 1699, it having been decided to make the river navigable at Exeter, nearly 200 women (of the parish of Alphington, appeared in white, with clean straw hats, mattocks and shovels—worked till evening; the next day 300 gardeners and hatters—and 300 Grecians of S. Sidwells, worked; DAWKS, *The Protestant Mercury* for 21 July, in MALCOLM, *Manners and History of Europe*, 8vo., 1811, p. 268. Jane (born 1677, died 1703, aged 26), daughter of sir C. Wren has the credit of having designed several of the city churches, especially the spire of S. Dunstan's in the east, and the screen of S. Peter's, Cornhill; the former was done 1698-9, and the latter 1681: canon Venables suggests that the tradition has arisen from there being a sort of feminine grace about the screen leading fanciful people to term it "sir C. Wren's daughter"; enlarged into "been designed by his daughter"; a flattering epitaph to her in the crypt of S. Paul's cathedral, is given in ELMES, *Memoir*, 4to., 1823, p. 385. *BUILDER Journal*, 1849, vii, 506; 1852, x, 690; 1860, xviii, 685.

WORM or MARINE WORM. See TEREDO navalis, the boring worm; PHOLAS; and LIMNORIA terebrans. INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, 8vo., 1842, ii, 67, 91, 174; vi, 54; ix, 23, 38, 41-8; and xviii, 437. CIVIL ENGINEER, ETC., *Journal*, 1850, xiii, 191; and 1857, xx, 16, with a list of timbers acted upon, prepared by R. Stevenson. *Result of Ravages in Creosoted Timber*, by D. Stevenson, in *idem*, 1862, xxv, 205; and ROY. SOCIETY OF EDINBURGH, *Proceedings*, 1861-2, p. 612. Fagus, Beech tree, gets worm-eaten (*Fr. carie*) especially if felled in the winter.

Timber considered proof against worms:—The Georgia pitch pine; Jarroo or JARRAH wood from West Australia (EUCALYPTUS), also from the white ants, CIVIL ENGINEER, ETC., *Journal*, 1862, xxv, 248; GREENHEART; the BASSIA comparatively; Chamærops or cabbage tree; CEVEY or Kinney, DUNJAY, Melley wood, or GRIS GRIS; resist, the first two in salt water, the last in salt and fresh water; as stated in CORREY, *Africa*, 8vo., 1807, p. 55-6. WYLSON, *Dry Rot and Worms in Timber*, in *BUILDER Journal*, 1845, iii, 32, 86.

To destroy the worms.—Fumigate well with benzine. Brush off the dust and saturate the wood with a strong solution of corrosive sublimate; or copal varnish in linseed oil; or an infusion of a bitter sort like quassia; or turpentine; or carbolic acid. After which a coating of copal varnish may be given. Silicic acid forced by hydraulic pressure into timber preserves it from the ants, and from the rot, and from being worm-eaten; *BUILDER Journal*, 1857, xv, 124. Saturate the timber with train oil. CREOSOTE. The most effectual plan is stated to be, to stud the pile with scupper nails, so closely, that the worm shall not get at the timber.

The common meal-worm, *Tenebrio*, has been found in the

corks of port wine, eating through it and so the wine escaping. WEIR suggests the use of bran instead of sawdust as the probable cause of their incursion into the cellar. WEEVIL. Vegetable mould is the work of worms, according to Darwin; BUILDER *Journal*, 1881, xli, 501. INSECT. XYLOPHAGI.

WORMS; (Lat. Borbitomagus and Augusta Vangionum). The capital of the canton in the grand duchy of Hesse-Darmstadt, and once an important imperial free city, situated on the river Rhine, crossed by a flying bridge. The town, of Roman foundation, was destroyed by the Vandals and Huns, rebuilt about 475 by the Franks; for some time the residence of Charlemagne; rose to great importance towards the end of the middle ages; in 1689 burnt by order of Louis XIV, when only the cathedral was saved; the city is still desolate in many parts formerly covered. It is walled, has massive towers of XIII and XIV cents., and seven gates. The memorial to Luther (1521) a bronze statue 18 ft. high, with others, inaugurated 24-6 June 1868, is given in *ART UNION Journal*, 1860, p. 283; Reitschel began 1856, died 1861, did Luther and Wickliffe, the others by his pupils Schelling, Dondorf and Kietz. The cathedral, dedicated to SS. Peter and Paul, was built 996-1016, rebuilt 1105-10; fell and reconsecrated 1181; it is a plain Romanesque building of red sandstone with two circular towers at each end nearly 200 ft. high, in one of which is the *eselsturm* or plane by which the materials were carried up by donkeys; a third the western one, and a central octagonal lantern; summit of the north-east tower fell 1429 and was restored 1472. The transepts are close to the west end with the church eastward, there being two choirs and altars for the chapter and the laity. The north portal 1472 has fine sculptures, and neighbouring chapter house is florid Gothic. The south doorway with good sculpture is XIX cent. work. The vaulting is XIII cent., and side chapels XIV and XV cents. The high altar under the dome is by P. A. Verschaefelt. Up to 1861 the interior was repaired with the east cupola, and roofs tied in. It is about 354 ft. long (108 metres), and 83 ft. high inside. MOLLER, *Deutschen Baukunst des Mittelalters*, fol., Darmst., 1821, i, plan pl. 5; gate of cloisters, pl. 10; façade, pl. 18: LEED'S transl., 8vo., 1836. KING, *Study Book*, etc., 4to., 1858-68, iv, gives two plates of the *dom*, two of S. Paul, and two of Notre Dame, churches. Plan in *Illustrations*, 1856-7, s. v. Church plan. HOPE, *History of Architecture*, 8vo., 1840, 3rd edit., pl. 40, 41, and 16. The west façade in MONTEUR DES ARCHITECTES, 4to., 1856, pl. 437-8. S. Paul's church, the west front and chancel date from 1016, is of interest; the nave is modern, and in 1877 was a warehouse. Notre Dame 1467. Trinity, on the site of the royal palace; S. Martin's, the west doorway is good XII cent. work. Two synagogues, one XII cent., or older, the vault carried on two piers of single shafts with capitals like those at Jerusalem; BUILDER *Journal*, 1867, xxv, 9 and plate. Of the episcopal court or *bischofshof*, only a few redstone walls remain, destroyed by the French 1689 and 1794, herein the diet was held of 1521. SCHANNAT, *Hist. Epis. Wormat.*, fol., Frank. and Wurzb., 1734. *Museum Wormianum, seu Historia Rerum Ravorum*, fol., Amst., 1755. 1. 14. 28. 50.

WORONESK or Woronesch. See VORONEJ or Voronetz.

WORONIKIN (A. N.). See VORONICHIN.

WOTTON (sir HENRY), born 30th March 1568, o.s., at Booton or Boughton hall, or Boughton hall, Kent. Studied at Winchester, New college in Oxford, and 1586 Queen's college; 1589 travelled in France, at Geneva, Germany and Italy, returning about 1598; again in 1602; knighted in 1603 and sent as ambassador to Venice, returned 1610; 1615 sent on a mission to the United provinces; again to Venice and returned July 1619; ambassador to the duke of Savoy and returned 1624; became provost of Eton college June 24, 1623. Among his writings was *The Elements of Architecture*, 4to., London, 1624, which has been reprinted many times. He died 5 December 1639. "Amateur Architect", in BUILDER *Journal*, 1883, xliii, 677, 738. WALTON, *Life*, 12mo., 1651. 14.

ARCH. PUB. SOC.

WOULT. A measure. Five woult high; two woult high; SPALDING CLUB, *Aberdeen Burgh Records*, 4to., Aberdeen, 1844-8. ii, 321.

WOVT; To. To vault or to arch. WOLT or vault.

WOYDZKO. Of Poland, in the X cent. went to Rome to study architecture for king Miecislav I. *Notizia presa dalla Descrizione della Città di Volau, in Silesia*, p. 152. CIAMPI, *Viaggio in Polonia*, 8vo., Flor., 1831, p. 152.

WRABEY (...), mason 1438. See HETHE and DRYELL (J.).

WRATISLAW. The Polish name of BRESLAU, in Silesia.

WREATH, garland, and torce. A circular ornament of ribbons, flowers or leaves, used for decorative purposes—to crown sacrifices at the altars, victors in games, conquerors in war—deserving citizens—in ancient times. The olive was dedicated to Minerva, palm to Mars, laurel to Apollo, myrtle to Venus, willow to Juno of Samos, oak to Jupiter of Dodona, poplar by the Eleans. In mediæval ages it was adopted to distinguish a knight, and consisted of the twisted garland of cloth by which the crest was affixed or held to the helmet. It is supposed to have been adopted by the crusaders in XIV cent. from the turban of the Saracens. These wreaths, supporting the crest of a coat of arms, are formed of the two principal colours of the arms, which are twisted alternately, and divide it into six divisions in modern heraldry. 78

WREATHED. In a column, is a spiral sinking, generally as a flat wave; sometimes an annulet is worked round; when annulets are coupled, mosaic work or jewels are often inserted, as in the reredos at Ely cathedral. OAKLEY, *Magazine of Arch.*, fol., 1730, pl. 23. LANGLEY, *Masonry*, fol., 1736, pl. 318 dup.

A wreath of a staircase handrail is continuous in a circular or elliptic staircase. When the well is square or oblong, the handrail is wreathed over each angle of the well. HANDRAIL.

WREN (sir CHRISTOPHER), F.R.S., born 20th October 1632, at East Knoyle, Wiltshire, son of Dr. C. Wren, dean of Windsor, from whom he seems to have inherited a taste for scientific and literary studies including architecture. The dean gave an estimate dated 15 May 1635, for a chapel for queen Henrietta Maria at Somerset house, amounting to £14,325 (ELMES, p. 10). The son was educated at Bletchington, Oxfordshire, under the rector William Holder, who married Susannah, Wren's sister, who died 30 June 1688 and was buried in S. Paul's crypt; Holder died 24 January 1696-7 aged 95 and is also buried there; (CUNNINGHAM, in BUILDER *Journal*, 1862, xx, 600). Some writers state that Christopher was entered at Westminster school, and then 1646 went to Wadham college, Oxford, where 1653 he was elected a fellow. On 7 August 1657 he was appointed professor of astronomy at Gresham college, London; 6 Feb. 1660 the Savilian professor at Oxford; and 1661 received the degree of D.C.L. from Oxford and Cambridge; and Sept. Charles II appointed him deputy-surveyor-general (under sir J. Denham who died 19 March 1667-8); 1 Oct. 1662 he is stated to have shown at the royal society the first proofs of mezzotinto engraving (*Parentalia*); 1663 declined the offer of employment to fortify Tangier, but designed the works; 1665-6 visited Paris in consequence of the great plague; 1669 became a member of the honourable artillery company; (12 or) 20 Nov. 1673 (not 1672 or 1674) was knighted (ELMES, 317); 1680 president of the royal society; 1685 member of parliament for Plympton, Devonshire; 1689 returned for Windsor but unseated, 1700 for Weymouth and Melcombe Regis, and 1715 for Windsor but unseated; 1695, with sir Godfrey Kneller and others, he was a trustee and "gave their hands to see the fair ordering and management of 'The new adventure' Lottery for £61,000"; (THE POSTMAN, Nov. 14-16, 1695). 1713 bought Wroxhall abbey, Warwickshire, an estate of 2,000 acres which continued in the family until it was sold August 1861; (fetched £93,000; B. J., xix, 556). He died Monday, 25 February 1723, aged 91, quietly, of a cold caught while returning from his residence on Hampton green, to his house in S. James's street; and was buried in the evening of 5 March in the crypt of S. Paul's cathedral; the hearse was pre-

ceded by a handsome cavalcade and followed by fifteen mourning coaches-and-six, as well as by several gentlemen's coaches; (POST BOY, No. 5,245, March 2-5, 1722-3; WEEKLY JOURNAL, March 9, 1723; FREEMASONS' MAGAZINE AND MASONIC JOURNAL, March, Sept. 3, 1859, p. 168). The names and dates of his family are given in detail in BUILDER *Journal*, Sept. 12, 1891.

Wren's watch is preserved in sir John Soane's museum. A portrait, full length, by sir J. Thornhill, is in the theatre at Oxford (DALLAWAY, *Anecdotes*, 474); one by sir G. Kneller 1711 was exhibited at the national portrait gallery; another (?) by him in the Royal Society, engraved by Edw. Scriven for ELMES, 1823; another by sir Peter Lely in the possession of sir James Wright, bart., is engraved in CUNNINGHAM, 1830; the portrait in *Parentalia* 1750 by S. Coignand; a boxwood bust by G. Gibbons, formerly belonging to James Wyatt, R.A., was presented 1861 by T. Willoughby to the Royal Inst. of Brit. Architects; the "very good bust" *cir.* 1673, at All Souls' college; the one in the picture-gallery at Oxford by Edward Pierce (WALPOLE, *Anecdotes*, 1849, ii, 392); and a bust in the south drawing-room of sir J. Soane's museum. A plaster cast of the face taken after death, is at All Souls' college; and another in the possession of miss Wren, at Ardlbraccan house, Meath, is mentioned in ELMES, 1823, p. 524.

His presumed connection with the Freemasons has been carefully investigated by GOULD, *History, etc., of Freemasonry*, 4to, 1884, iii, 1-49, who writes "in my opinion the evidence points" to Wren *not* having belonged to a lodge, nor to a society not in existence until 1717. The mallet with which it is said that king Charles (or himself) 1673 laid the foundation stone of the cathedral, is inscribed 1827 as presented to the old lodge of S. Paul's, now the lodge of antiquity, by "brother sir C. Wren, R.W.D.G.M." (B. J., 1865, xxiii, 492; 1872, xxx, 674); of this inscription, GOULD, iii, 47, writes, "in it are three mis-statements". Candlesticks of the Doric, Ionic, and Corinthian orders given to the lodge of antiquity No. 1 "ex dono Chr. Wren, esq. A. L. 5680"; and portrait by G. Kneller, with a placard stating "grandmaster in 1685", were exhibited at Ironmongers' hall, 11 May 1861.

In Whitehall he had a house "of sixteen rooms and a cellar" as surveyor-general of the king's works, from 1661 or 1669 to 1718, as he was not burnt out in 1697; (BRIT. MUS., Lansdowne MS. 736, signed 29 Feb. 1688-9); he held a small house on Hampton green, on lease from the crown, at £10 per annum, from 26 Aug. 1706 for fifty years, renewed 8 Jan. 1737 to his son for 28½ years from 20 Sept. 1758; and one in S. James's street after 1718 where he died. It is thought that the house on the slant over the entrance to Dean's court, S. Paul's churchyard, was his office, and so built from which he could supervise the works of the cathedral. The following are also traditionally named as residences: No. 5, Walbrook; a house in Shoemaker's row, Carter lane; in Botolph lane, now the Billingsgate ward school; Boyer or Bowyer house, Camberwell road; in Friday street next the church of S. Matthew; a large house in Great Russell street, Bloomsbury, built by himself and also occupied by his son (ELMES, 522, this is supposed to be the present Nos. 100, 101, and 102, called Thanet house) from about 1725; and the Falcon foundry, Bankside, Southwark, as the place where the iron railings for S. Paul's were finished, and from whence he viewed his numerous works during erection. "Christopher Wren of St. Martins in the Fields Esq. Dr. of Laws, and Surveyor of his Majesties Works", in BLOME, *Britannia*, fol., 1673, p. 405.

In regard of his "remuneration" only the following have been noted. Wren received only £200 per ann. as surveyor-general and architect to S. Paul's cathedral, 1675-1711. As surveyor-general of H.M. works, he had in 1675 the fees of 13s. 2d. per day, avails of £80 per ann., with in 1715 an allowance of £45 per ann. as Exchequer salary; also riding charges 4s. 10d. per day; and for surveyor's man 3s. per day Sundays excepted (office-books, 1779-80); besides the official residence in Whitehall. CUNNINGHAM, p. 240, says, "Wren had

made the plans and superintended the erection of Greenwich hospital free of all expense, saying, 'Let me have some share in an act of charity and mercy';" the fee was £200 later, if not then. It is presumed he had also a payment for each service, as Vanbrugh, comptroller, had for Blenheim. A MS. account for July 1670 to March 1673 records "by allowances, for rebuilding the churches, to the officers of the works for ye management of the whole at xij p lb. for all moneys received and paid"—£2,725 is charged on a receipt of £54,500, only about £66 being then in hand; (Harl. MS. 4941, f. 76). In 1694 as controller of the works at Windsor castle he had a salary of £9 2s. 6d. per ann. In 1669 he had 100 guinea pieces (valued at £107 10s.) for his directions in the works and for the design of a model for S. Paul's. A few other gratuities are mentioned, as *cir.* 1684, "a gratuity of five guineas" to Wren "for his care in promoting the finishing the steeple and spire" of S. Martin Ludgate. "1685 to one-third of a hogshead of wine given to sir C. Wren £4 2s.", S. Clement Eastcheap. In 1679 the parishioners of S. Stephen Walbrook offered "a purse of twenty guineas to the lady of sir C. Wren as a testimony of the regard that the parish has for the great care and skill that sir C. Wren showed in the rebuilding of the church", (WARD, *Lives*, p. 104). Wren in his will dated 14 April 1713 (died 1723), mentions £15,000 in trust for Mary Musard, the late (first) wife of his son Christopher, and leaves the remainder of his property to him, including the care of his other son William for his life (who died 15 March 1738).

Mr. C. Wren's eleven letters from Hampton court 1737-42, to Dr. Ward concerning his father's life and the family; also to his cousin James Hodgson 1737-9 of Christ's hospital; and referring to his papers being in the care of his relative Dr. Bateman, chaplain to the archbishop of Canterbury, (Addit. MS. 6209, p. 153-162). JOHN WARD, *Lives of Prof. of Gresham College*, fol., 1740, p. 95-110. WREN, *Parentalia*, fol., 1750. WALPOLE, *Anecdotes*, 8vo. edit., 1862, ii, 559. *Life*, in BIOGRAPHIA BRITANNICA, by Dr. Nicolls, 1763. Q. DE QUINCY, *Vies des Architectes*, 8vo., Paris, 1830, i, 241. CHALMERS, *Life*, in *Biography*. *Life*, 12mo., 1821. *Life*, in Lib. of Useful Knowledge, 8vo., 1823. KER, *Life*, 4to., 1824. ELMES, *Life of Wren*, 4to., 1823; and *Brief Epitome*, in CIVIL ENGINEER, ETC., *Journal*, 1847, x, 234. CUNNINGHAM, *British Architects, etc.*, in "Family Library", 8vo., 1829-33. ELMES, *Wren and his Times*, 8vo., 1852. *The Family of Sir C. Wren*, B. J., 1856, xiv, 537, from "The Wiltshire Magazine"; and by CUNNINGHAM, in B. J. 1862, xx, 601. PHILLIMORE, *Sir C. Wren, his Family and Times*, 1585-1723, 8vo., 1881. T. R. SMITH, *Lecture*, in BRITISH ARCHITECT *Journal*, 4 Oct. 1889, 245, etc. 1. 2. 3. 14. 25. 34.

Nicholas Hawksmoor was a "domestic clerk" from 1679 and assisted generally to about 1711; W. Dickenson and John James may have been pupils or clerks. *Cir.* 1683, "a payment of two guineas to Mr. Stopford, the clerk of sir C. Wren, to urge him on with the rebuilding of the church"—of Allhallows the great, Upper Thames street. No other office assistants occur. Tho. White, statuary, was sent to Rome by Wren to measure S. Peter's and assisted in making the first model of S. Paul's: he settled at Worcester. Jane Wren, his daughter, has traditionally designed some of the churches. This was the period of the master tradesman, who visited the architect's office in the morning, and received instructions, rendering unnecessary the numerous and elaborated detailed drawings of the present day. The clerk of the works kept the accounts and usually the "measuring up" was done by him on prices arranged previously; the architect sometimes advancing money and receiving five per cent. for the accommodation. The care Wren took of the details is well known, from the letter he wrote thereon to one of his clients; given in *Parentalia*, CUNNINGHAM, p. 200; etc.

WORKS AND BUILDINGS.

The following is a list of Wren's professional works commenced from the *Vitæ et actorum* drawn up by his son and signed

by Wren and dated 1720, in British Museum, Lansdowne MS. 698; printed in *ELMES, Memoirs*, and in his *Wren, etc.* The names of the persons associated with Wren have now been inserted where found. Further details of the works designed as surveyor-general would be no doubt forthcoming on an inspection of the "Office Books of Accounts". The dimensions of the churches given in *Parentalia*, and *MILIZIA, Lives*, edit. by Cresy, are not inserted as they vary somewhat from the measured drawings by CLAYTON; and their cost, as usually given, is also not here inserted. The dates are in many cases approximate, as authorities are found to vary. *ELMES* intimates that Wren designed all the Halls of the Companies, but only those where his name is usually found are here inserted; for instance E. Jerman who was surveyor to the Mercers' company is more likely to have designed the new premises than Wren; and so with others. The names of the churches where pulled down are inserted in italics; but other destroyed buildings are not so described.

- 1656 Oxford. Cloister and chapel of Brasenose college (tradition).
 1660-63 Lambeth palace. Roof of great hall, for bishop Juxon.
 1661 Sept. At Whitehall as deputy surveyor-general under Denham. T. Rotherham, clerk of the works.
 1662 Member of a small commission for roads, streets, and bridges.
 1663 Tower of London. Walls of White Tower restored, ditch scoured, etc., under Denham. E. Gammon, clerk of the works, 1660-70.
 1662-9 Lichfield cathedral. Centre spire after its fall.
 1663 Old S. Paul's cathedral. Surveyed with Denham and John Webb and reported as to its restoration; fitted up the choir; and again after the great fire of 1666.
 1663-5 Cambridge. Pembroke college chapel, for his uncle.
 1663-7 Greenwich. Surveyor there. L. Gammon, clerk of the works John Webb engaged 1668-70.
 1664 July 26—68 July 9. Oxford. The Sheldonian theatre; his assistant R. Frogley, an able carpenter. Cost £12,470 11s. 11d. DALLAWAY, *Anecdotes*, 8vo., 1800, p. 91; "he owed the original idea of the roof to S. Serlio, and Dr. Wallis, whose plan was given to the Royal Society, its size is 70 ft. by 80 ft." A MS. of 300 pages of the expenses is in the Bodleian library. In 1720 it was stated to be in a dangerous state, but W. Townsend, mason, Jer. Frankland and Thos. Speakman, carpenters, examined and reported as to its excellent condition. A new roof in 1800.
 1664-80 Windsor castle. With Denham, designed the 'Star' now the 'Stuart' building, being all the state rooms; Hugh May, comptroller and architect. Varrio at work 1676-1701. Greatly altered under sir J. Wyattville.
 1665 Cambridge. Lodgings for scholars at Trinity college; built by Thomas Strong, mason, under Dr. C. Wren.
 1666 Oct. 4. Appointed on committee with May, and Pratt, and the surveyors of the corporation, with Hooke, Mills and Edward Formyr for looking to the interests of the wards, etc., to survey the ruins of London after the fire, and plans for laying out the devastated space. *PRICES, Historical Account of the Guildhall*, 4to., 1886, p. 218. A plan was published 1748 by the Society of Antiquaries; another 1744 engraved by Fourdrinier; a third 1749 by J. Gwynn, engraved by Rooker; copy by Elmes in *Report on Improvement of the Port of London*, engraved 28 July 1800.
 1666-8-77 Cambridge. Emmanuel college chapel.
 1667-9 S. Dunstons in the East; tower and spire only; as stated by BRITTON; but see 1698.
 1667-9 Royal Exchange; but E. Jerman was the architect; finished by ... Cartwright, mason, 1669. Wren was consulted on east and west porticoes. A view 1671 engraved by R. White. Burnt 10 January 1838.
 1667 Oxford. Trinity college, new court, north side; 1682 west side; south 1728.
 — Act of parliament for rebuilding thirty-nine churches in the city.
 1667-71 or 1671-8 S. Mary le Bow, Cheapside; the spire completed 1677. Engraved plan and view with the arcade in front as originally designed. The ancient crypt in *VETUSTA*, v., by G. Wilt; who wrote *Observations chiefly relating to its Original Structure*, 10 pl., fol., 1828. The tower and spire engraved by Le Keux after measurements by J. T. Christopher, fol., 1858.
 1668 Aug. 3. Old S. Paul's cathedral. Denham had been appointed on the commission to destroy the dangerous portions of the cathedral; Wren was appointed 30 July 1669 (*MALCOLM*, iii., 86). *MS. Account* of the rebuilding the church from Sept. 1666 to Sept. 1700, is in the library at Lambeth palace.
 1668 Consulted Henry Howard of Norfolk on his design for a building for the Royal Society; R. Hooke to get a model made (*ELMES*, 237).
 1668-9 No. 73 Cheapside, for the Mansion house; about 1825 occupied by Tegg; repaired 1821.

- 1668-78 Custom house, Lower Thames street. Edw. Kingsley, carpenter; Thos. Watkins £2 12s. 6d. per month for looking after the work; Joshua Marshall, mason; Richard Boys, bricklayer; Lawrence Gammon, measurer. Burnt 1718.
 1668 Aug. 31. Salisbury cathedral. Report of survey. Letter in reference, Brit. Mus., Add. MS., 6209, f. 163. See 1670.
 1668-1711 Sion college, Aldermanbury. Enlarged and library added.
 1669 Cambridge. Consulted about west side of third court of S. John's college.
 1669 March 28. Appointed surveyor-general of all the royal works. *Parentalia*, 263.
 1670 Dec. 1—73. S. Benet Fink, Threadneedle street. First stone laid by Thos. Stonyear, son of the parish clerk. Pulled down 1842-4 for the new royal exchange.
 1670 cir. Eton college. Upper school with arcade beneath, £1,500. Screen in hall, removed 1858.
 1670 cir. Innholders' hall, Great College street, Dowgate hill, with E. Jerman; rebuilt 1836.
 1670 cir. Painter Stainers' hall, Little Trinity lane, Up. Thames street.
 1670 cir. Plasterers' hall, Adile street.
 1670-2 Temple Bar, Fleet street. Reported unsafe after the buildings on north side were removed, March 22, 1868; pulled down 1878.
 1670 Salisbury cathedral. See 1668. Consulted as to spire, etc. *ACBBREY, Wiltshire*; B. J., 1847, v., 494-5. Also as to the old hall in ruins 90 ft. by 36 ft. to be rebuilt.
 1670-4 S. Sepulchre, Skinner street; large restorations except to porch and tower. Great reparations 1790.
 1671-81 The Monument, 202 ft. high; cost £14,500. Autograph letter July 28, 1675 to the city, with drawings as to a statue, phoenix, or globe, Brit. Mus., Add. MS. 18,898 and Sloane 5238. B. J., 1858, xvi., 13. Alto relieve by G. Cibber. Description in B. N. J., 1866, xiii., 692, 698, 715. ACKERMANN, *Repository of Arts*, 8vo., 1812, vii., 236.
 1671 Vintners' hall, Upper Thames street. Rebuilt 1820-3.
 1671-8 S. Mary le Bow. See 1667-71.
 1671-80 S. Bride, Fleet street; and works 1699. W. Dickenson, assist. surveyor.
 1671 cir. Haberdashers' hall, Stainging lane, Gresham street; or by E. Jerman. Burnt 1864.
 1671 and 1696 S. Christopher le Stocks, Threadneedle street; repaired by E. Strong, junr.; pulled down 1781; and absorbed by the bank of England.
 1671 12 April—1673 St. Lawrence Jewry, Gresham street. First stone laid by the churchwardens.
 1671 Nov. 9. Dorset Gardens theatre; destroyed 1709; GENTLEMAN'S MAGAZINE, 1814, pt. 2, lxxxiv., 9.
 1672 Oct.—1679 S. Stephen Walbrook. Built by Thos. Strong, mason, and Chr. Kempster, assistant, and Edward Strong, senr. B. J., 1882, p. 309. ACKERMANN, *Repository of Arts*, 1814, xi., 160. LONDON AND MID. ARCH. SOCIETY, *Trans.*, v., 327-402.
 1672 Dec. 16. Old S. Paul's cathedral. The present church had the preference, a model to be erected large enough to admit a man in it; chapter house to be roofed to receive the model; *MALCOLM*, 87.
 1672 Tallow Chandlers' hall, Dowgate hill.
 1672-9 S. Michael, Cornhill. 1715 tower taken down, and 1718-21 or 3 (Gothic) rebuilt, by E. Strong, junr.
 1672 Old Jewry. House for sir Rob. Clayton; used for the London institution, and pulled down 1864 (*HUGHSON*, 77).
 1672-8 S. Mary at bill, Tower street; interior and east end. Greatly restored 1848-9 by J. Savage.
 1673-4 Drury Lane theatre, after fire of 1671.

1673 Nov. 12, S. Paul's cathedral. Appointed surveyor-general and a commissioner for the new building. 1674 June 4, a new commission, Wren, with Edw. Woodroff, surveyor and assistant, and John Tillison, clerk of the works. The first design is shown in the model still preserved in S. Paul's; of which carefully measured drawings by E. C. Sayer, and views of interior by J. E. Goodchild, are at the Royal Inst. of British Architects. The approved (extraordinary) design which received the sign manual of king Charles II and others, dated 14 May 1675, is engraved in *LONGMAN, The Three Cathedrals of S. Paul*, 8vo., 1873. 1675 June 21; "the first stone was laid in the new foundation at the south-east corner of the choir" (*DEGDALE, S. Paul's*, note, p. 140, from Bateman's *Account*, MS in Lambeth library) by sir C. Wren and Thomas Strong, master mason and contractor; the second one by ... Longland, the chief carpenter. Edward Strong, the son, mason, succeeded 1681; "who did the east end of the cathedral, the north portico, the north-west leg or quarter of the drum, and so westward to the middle of the window of the morning prayer chapel" (*CLUTTERBUCK, Hertfordshire*, fol.,

1815-27). Jasper Latham, mason, did the north doorway, etc. (MALCOLM). 1707 Richard Jennings, master carpenter, who was superseded by Jos. James of Greenwich by the commissioners at a salary of £200 per ann. (GWILT). Sir C. Wren had £200 per ann.; John Oliver (appointed 2 Dec. 1675 on death of Woodroff) assist. surveyor and purveyor, £100 (died after 1691); Lawrence Spencer, clerk of the works and paymaster, £100; Thomas Russell, clerk of the cheque, £50; (BUILDER *Journal*, 1858, xvi, 761, describing their duties, from Harl. MS. 4941; and in CITY PRESS, 10 Sept. 1864). John Tillison 1685 succeeded Spencer. Wren 1675-1711 was assisted by N. Hawksmoor. T. Bateman in 1710 was deputy to Wren. Henry Wood a clerk of the works.

The works proceeded from the west end. In 1694 the scaffolding outside and inside was removed. 1697 Dec. 2, or 5, first service in the choir. 1706 lantern begun by Edw. Strong, junr. 1708 cupola covered with lead. 25 or 26 Oct. (1708 or) 1710 last stone of the lantern laid by C. Wren, junr., E. Strong, and E. Strong, junr. Marble paving under the dome and in transepts laid down by E. Strong, junr., who repaired defects in the legs and arches. 1715 new commission for carrying on, finishing, and adorning the cathedral. Cost £736,752 2s. 3d. and for wall and railing £11,202 0s. 6d., making £747,954 2s. 9d. 1697 Sept. 29, only a half of Wren's salary to be paid until completion; 1710, 9 Anne, c. 17, declared completed and to be paid on or before 25 Dec. 1711, and salaries to cease. 1717 balustrade added by the commissioners against Wren's wishes, (WEEKLY PACKET, Oct. 12-19, 1717).

Fact against Scandal, 8vo., 1713; and an Appendix, 1713, being answers to pamphlets entitled *Frauds and Abuses at S. Paul's*, 8vo., 1712; and *A Continuation*, etc., 1713. Letter 1695 to the duke of Newcastle at Welbeck about timber for the roof (ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1860, p. 206). "Section of S. Paul's cathedral decorated agreeably to the original intention of Wren", by S. Wale and J. Gwynn, engraved 1755 by Rooker. DUGDALE, *History of S. Paul's*, cont., etc., by Ellis, fol., 1818, p. 173-92. MILMAN, *Annals*, 2nd edit., 8vo., 1869; and *Handbook*, 8vo., 1869. SHONE, *Gleanings*, 8vo., 1871, describes the "Appeal for funds", etc., from 1858. MALCOLM, *London Redivivum*, 4to., 1803, iii. AIRIN, in BRITTON, *Fine Arts of the English School*, 4to., 1832.

- 1673-84 S. Martin, Ludgate hill.
 1673-4 S. George, Botolph lane, Eastcheap.
 1673-80 Sept. 26 S. Olave, Old Jewry. Sold July 1891.
 1674-89 College of Physicians, Warwick lane. Front part pulled down April 1866; rear burnt 3 Jan. 1879.
 1674 Pedestal for the statue of Charles I at Charing Cross; carved by Joshua Marshall; attributed also 1680 to G. Gibbons.
 1674 June 25-75 Allhallows Staining, Mark lane. First stone laid by the incumbent. Pulled down 1870 except the tower.
 1674 S. Olave, Hart street; portico and remodelled.
 1674 Lincoln cloisters. Formed the Roman Doric cloister on its north side, and built the library over it, for dean Honywood, after the fire 1609 of the mediaeval library on east side. The specification is in the archives; W. Evison, builder, to a model.
 1674-79 S. Dionis Backchurch, Leadenhall street; 1684 tower and steeple. Pulled down 1878.
 1675-9 Greenwich, Royal Observatory, Flamstead house; with sir Jonas Moore, surveyor-general of the Ordnance, died 1679.
 1675 S. Michael, Wood street.
 1676-80 Cambridge, Trinity college library; attributed to dean Aldrich, carried out by Wren. DALLAWAY, *Discourses*, 1800, p. 99. Drawings in All Souls' college were used for the new ceiling in the time of prof. Willis.
 1676-83 S. James, Garlick hill. Restored 1867. Lanthorn by E. Strong, junr.
 1676-80 S. Magnus, Fish street hill, London Bridge. 1705 tower and spire; Wren formed an archway under it for future traffic; used 1759.
 1676-9 S. Michael Bassishaw, Basinghall street.
 1676 S. Mildred, Poultry. Pulled down 1871.
 1676 S. Stephen, Coleman street.
 1677 S. Nicholas Cole abbey, Old Fish street, Doctor's Commons. Said to be the first rebuilt after the fire (STRYPE).
 1677 S. Mary Woolnoth, Lombard street; repaired only. Rebuilt 1716-9 by N. Hawksmoor.

- 1677 S. Michael le Quern, Queenhithe, Upper Thames street. Pulled down 1876.
 167 -9 S. Bartholomew, Threadneedle street. Pulled down 1841; rebuilt in Moor street.
 1677-83 S. Mildred, Bread street; domical ceiling. Built by E. Strong, senr.
 1677-83 S. Benet, Paul's wharf, Upper Thames street; built by Thomas Strong, mason, continued by E. Strong, senr.
 1677 Lamb's conduit on Snow hill; plate in the SOANE, *Pennant*, p. 221.
 1677-8 (or 1694) S. Michael Paternoster royal, College hill. Built by Edward Strong, mason. Steeple 1713. Lanthorn by E. Strong, junr.
 1677 S. Mary Aldermanbury, Love lane and Addle street.
 1678 Jan. 29 £70,000 was voted for a solemn funeral of King Charles I, and to erect a monument on site of the tomb house at Windsor castle. Design at All Souls' college.
 1678 Discovery of the bodies of two children in the Tower, and removal to Westminster abbey, and the urn designed.
 1678-80 S. Swithin, London stone; now in Cannon street.
 1680 S. Austin, Watling street; built by Thomas Strong, mason, and Edward.
 1680? S. Anne and S. Agnes, Gresham street.
 1680 Northampton, All Saints' church. Portico of twelve Ionic columns. ASSOC. SOCIETIES, *Reports and Papers*, 1881, p. 83.
 1680 April 29. Dublin, Kilmainham hospital. First stone in north west quoin of north west flanker; opened 25 March 1684, completed 25 Dec. 1686; carried out under sir William Robinson. MALTON, *Dublin*.
 1680 Moor Park, Hertfordshire, for duke of Monmouth. Pulled down 1720 by C. Leoni.
 1680 cir. Easton Neston, Northamptonshire, for earl Pomfret; wings only. The body 1702 by N. Hawksmoor; CAMPBELL, *Vit. Britt.*, fol., 1715, pl. 98-100.
 1680-2 S. Clement Danes, Strand; the body and lower part of the tower, assisted by W. Pearce and John Shortrose, Brit. Mus., Add. Charters, 1605. Wren "generously bestowing his great care and skill towards the continuing and building of it". Tower 1719 by James Gibbs.
 1680-4 S. James, Westminster, in Piccadilly; for Henry Jermyn, earl of S. Albans. Steeple 1690 by Wilcox, a carpenter.
 1680-4 Allhallows and S. John Evangelist, Bread street. Pulled down 1876.
 1680-3 Allhallows the great, Upper Thames street. Tower rebuilt 1876 on south side and aisle cut off.
 1681 S. Peter, Cornhill; opened Nov. 27.
 1681-2 S. Mary Aldermay, Bow lane, Cheapside; 1510 Gothic. Rebuilt or restored as a copy for the widow of Henry Rogers citizen, who left £5,000. Steeple built 1629, £1,000; repaired 1703 and 1711. Church restored, etc., 1876-7.
 —? Oxford. All Souls' college; screen in chapel assisting sir J. Thornhill. Large dial on north side of old quadrangle.
 1681-2 Oxford. Christ church college, gateway. Gothic.
 1682 Cambridge. The Tribunal at Trinity college; probably.
 1682 March 12—90. Chelsea hospital. Cost about £153,000. N. Hawksmoor, deputy surveyor. Engraved plan dated 1690 drawn by Rob. English, comptroller.
 1682-3 S. Antholin, Watling street; built by ... Cartwright, who altered the design. Pulled down.
 1682-94 Christ's hospital, Newgate street. Writing school, etc. Old cloister repaired.
 1682-3 S. Augustin and S. Faith, Watling street. Spire added 1699.
 1683 cir. Dublin. The Tholsel. B. J., 1874, xxxii, 831. MALTON, *Dublin*.
 1682-3 Oxford. Ashmolean museum: Thomas Wood, builder.
 1683 Oxford. Queen's college chapel. See 1710.
 —? Oxford. Divinity school; old stone vaulting restored.
 1683-4 Chichester cathedral. Repair of the spire.
 1683-4 Fawley court, Oxfordshire, for W. Freeman.
 1683-6 S. Clement Eastcheap, Clement's lane; built by E. Strong, senr.
 1683-5 Winchester. The royal palace for Charles II. N. Hawksmoor, supervisor; Edw. Strong, mason, with T. Kempster up to water-table. 1696 Thos. Bateman, clerk of works, and in 1704; succeeded by J. Stockley. Remained a shell: now barracks and depot.
 1683 Winchester. The episcopal palace for bishop Morley (1662-84).
 1684-8 Middle Temple. Gateway in Fleet street; and 1681 part destroyed by the great fire.
 1684 Somerset house fitted up for the queen dowager.
 1684 Windsor castle; appointed controller on death of Hugh May, with a salary of £9 2s. 6d. per annum.
 1684 The Deanery, in Dean's court, S. Paul's churchyard.
 1684-6 S. Alban, Wood street. Gothic: restored.
 1685 S. Benet, Gracechurch street, south corner of Fenchurch street. Pulled down Nov. 1867.
 1685 Westminster hall; fittings for coronation of James II.
 1685-92 Tower of London. Grand store-house, north of the White Tower, of two floors, 245 ft. by 60 ft.; and new or store armoury, 24 ft. high. Burnt 1841.
 1685 and 1697 Library for archbishop Tenison, Castle street, S. Martin's lane, assisted by J. Evelyn. Sold 1861.

- 1685 *S. Mary Magdalen*, Old Fish street, Doctors' Commons; built by Edward Strong; burnt, not yet pulled down 1891.
- 1685 *S. Matthew*, Friday street; opened Nov. 29; pulled down.
- 1685-9 Belton house, Lincolnshire, for sir John Brownlow, third baronet; NEALE, *Seats*, ii, 1819.
- 1685 *cir.* House for duchess of Monmouth, Lawrence st., Chelsea. Drawing.
- 1686 *S. Mary*, Abchurch lane, Cannon street.
- Bath street, Newgate street; Charles II's bath; ARCHITECT *Journal*, 1850, ii, 483.
- 1687-9 *S. Margaret Pattens*, Rood lane, Fenchurch street.
- 1687 Banqueting house, Whitehall; with paintings by Parry Walton; all repaired. ELMS, p. 448. Restored by sir John Soane.
- 1687? *S. Michael*, Crooked lane, Fish street hill. Taken down 1830 for new London bridge.
- 1687-1704 Christ church, Newgate street. Lanthorn by E. Strong, senr.
- 1687 *S. Andrew*, Holborn, repaired. Tower 1704 refaced with stone.
- 16...-90 *S. Edmund the King*, Lombard street. Modernised.
- 1690 *S. Margaret*, Lothbury; modernised 1890-1.
- 1690 Kensington palace, Feb. 25. South-east portion. N. Hawksmoor, clerk of the works.
- 1690 House of Commons: repaired the buildings.
- 1690-4 Hampton court palace, for king William III. East or garden front 330 ft. long, south front 328 ft. BREWER, *London and Middlesex*, 8vo., 1816, iv, 462. W. Talman, comptroller 1690-9. In 1699 Wren gave an estimate for finishing part of the interior, £6,800; BUILDER *Journal*, 1849, vii, 927; 1862, xx, 601; 1876, xxxiv, 84. The Fountain court, liv, 212 pl.
- 1691 The mint or moneyers' hall in the Tower of London.
- 1691 Oxford. Consulted on design by dean Aldrich for chapel of Trinity college.
- 1691 Savoy. Reported on its properties and condition. ELMS, 462.
- 1691-2 *S. Andrew by the Wardrobe*, Doctors' Commons.
- 1692-1716 Greenwich. Royal Naval hospital. John Scarborough, Henry Simmons, N. Hawksmoor, and John James were clerks of the works; first stone laid at five o'clock on 30 June 1696, by Wren and Evelyn, with Flamstead. Edw. Strong, mason, with Thomas Hill, then Ephraim Beacham, and then Edward James. An original drawing in sir John Soane's museum.
- 1692 New road from Hyde park corner to Kensington palace.
- 1692 May. Chatsworth. Surveyed the works designed by W. Talman. Wren is considered to have designed the east and west fronts, up to 1706.
- 1692-1711 *S. Thomas's hospital*, Southwark.
- 1692-4 House for duchess of Buckingham; query Arlington st. Drawing.
- 169-95, Feb. *S. Mary Somerset*, Upper Thames street. The first church destroyed under the union of city benefices—the tower left standing, Oct. 1867.
- 1694 The Savoy, converted into a state prison.
- 1694-5 Tower of London. Apartments for state prisoners of highest rank. Reported on the towers and proposed buildings. ELMS, 472.
- 1694-7 *S. Vedast*, Foster lane, Cheapside; built by E. Strong, mason, with W. Collins of the parish.
- Audley End, Essex; repaired, etc.; ELMS, 477.
- 1694 *S. Michael royal*, College hill. See 1677-8.
- 1694 Allhallows, Lombard street, in Ball alley, near east end.
- 1694 Warwick; Church and steeple; but was designed by W. Wilson.
- 1695-1702 Morden college, Blackheath; Edw. Strong, mason. Also Dartmouth chapel, and Bohun's or Booth's chapel.
- 1695 Trinity almshouses; 30 houses said by Wren.
- 1697 Whitehall; destroyed by fire. He had designed the altar-piece for the old chapel; and the one for the private chapel of James II, which was given to Westminster abbey.
- 1697 Appleby school. LYSONS, *Magna Britt.*, co. Derby, 4to., 1817, p. 6.
- 1697 York; the brick tower of the church of *S. Cruz*, Pavement.
- 1698-9 *S. Dunstan's-in-the-East*; tower and spire only (GODWIN, *Churches*); but see 1667-9.
- 1698 Windsor castle. Design for William III for rebuilding the south side of the Upper Ward, at All Souls' college.
- 1698 March 11. Westminster abbey. Surveyor-general and sub-commissioner for the repairs, etc. Copies of the accounts 1698-1705 in the Gough collection in the Bodleian library. 1697 Edw. Tuffnel appointed mason.
- 1699 Ely cathedral. Rebuilding part of north west transept which had fallen.
- 1699 Allhallows, Barking. ? Repaired by him.
- 1699 Eton college chapel. Altered and library designed 1726 traditionally.
- 1700 *cir.* Oxford. Works at Pembroke college.
- 1703 Buckingham house, *S. James's park*, rebuilt for duke or duchess of Buckingham; ? by Wynn. Drawings.
- 1705-6 Isleworth parish church, Middlesex, partly his design. LYSONS, *Environ.*, 4to., 1795, ib, 100.
- 1705 Newbie hall, Yorkshire, for Richard Weddel, passed to T. W. Robinson, lord Grantham. *Beauties of England*, etc., 8vo., xvi, 711.
- ARCH. PUB. SOC.
- 1706 *S. Stephen's chapel*, Westminster, newly fitted up for the admission of the additional forty-five members for Scotland; when the wainscoting was removed 1800 the ancient paintings were discovered. HATTON, *New View of London*, 1708.
- 1708 Appointed on the commission for building 50 new churches.
- 1708 *S. Paul's cathedral*. Statue of queen Anne by Francis Bird, and bas-reliefs in the pediment.
- 1709-10 Marlborough house, Pall mall, for duke of Marlborough.
- 1710 Royal Society. Design and model for a room in Crane court. CAMDER SOCIETY, *Letters*, 4to., 1843, p. 346.
- 1710 Oxford. Chapel of Queen's college, traditionally; other buildings by N. Hawksmoor. See 1683.
- 1712 *S. Paul's cathedral*. Chapter house, cost £3,092 7s. 7d.; NOTES AND QUERIES, 5 Ser., 1878, x, 462-3.
- 1713 Cambridge. Consulted on new buildings at King's college.
- 1713 Westminster abbey. Restoration of the ancient lower portions of west façade and towers. Upper parts by N. Hawksmoor 1735-39.
- 1720... Staunton appointed master mason. See below.
- 1713 Windsor. The Court house.
- 1717 Tower of London. New main guard. Query.
- 1718-9 Westminster school. New dormitory, or by earl of Burlington.
- 1718-23 *S. Michael, Cornhill*, Tower (Gothic) rebuilt by E. Strong, junr., under Act of parliament; drawing by Wren, July 1716, and one by W. Dickenson May 1716 in the king's collection at British museum.
- 1718 April 14, deprived of the office of surveyor-general, in favour of W. Benson; "Memoirs of John Ker of Kersland" by himself, 8vo., 1726, p. 100-10.
- 1719 A drawing approved May 20, for the restoration of the exterior of the north transept, and signed by Wren, Mich. Evans, Thos. Sprat (dean, died 1713), Har. Barker, and Wm. Morice (high bailiff), is given in BUILDER *News Journal*, Oct. 26, 1888, p. 538; with a list of other illustrations of Westminster abbey, given in that *Journal*.
- 1723-3 Feb. 25, "Solomon's porch just finished"; great west window 32 ft. square painted by Price; BUILDER *Journal*, 1849, vii, 59. 1732-25 W. Dickenson surveyor. "North west prospect of W. Abbey with the spire as designed by sir C. Wren", by J. James (surveyor to the abbey 1725-40), engraved by Fourdrinier.
- Nos. 1 and 2 houses on Laurence Pountney hill, Cannon street; two houses with pediments on College hill, west side, for duke of Buckingham; earl of Oxford's at *S. James's*; lord Allston; by the Thames for lord Sunderland; (duke of Newcastle, is an error, it is by Wynn); a house south side of Queen's square, Bloomsbury; madam Cooper's lodging, Cleveland court, *S. James's*; the Doric court, council chamber, audience room, drawing room, etc., in *S. James's palace*; two houses at Chichester; old record rooms at Westminster; and house of duke of Norfolk on site of Arundel house, Strand. These are designs, all perhaps not carried out.

DRAWINGS AND PAPERS.

A collection of about 270 original designs and drawings attributed to Wren, exist at All Souls' college, Oxford, presented by sir William Blackstone, and bound 1800 in three volumes, with two other volumes; having been obtained by him at the sale of the libraries of the two Wrens, 26 October 1748. A list by Elmes 1807, was printed in the "General Chronicle" 1812. Another 1836 by G. Gutch is in the library of the Royal Institute of British Architects. These drawings are described in BUILDER *Journal*, 1860, xviii, 505. In the British Museum, Add. MS. 5238 gives No. 67 Bow steeple, and Nos. 70-8 plans, statue, etc., of the Monument. In sir John Soane's museum are various architectural designs for Hampton Court, etc.; tracings of the first design for *S. Paul's*, and a west elevation of the finished work. The original drawings for *S. Paul's*, preserved in the cathedral, were exhibited at the London and Middlesex Archaeological Society, April 10, 1865, and described by A. Ashpitel, *Transactions*, iii, 39-51.

Reports made by sir C. Wren relating to Royal palaces and various public buildings, all of which came incidentally under the notice of the *Treasury*, are now in the Public Record Office; 16th report, deputy keeper of the Public records, 1854-5, xv, 737. "Court Orders, Estimates, Reports, etc., 1671-95", in MS. fol. which was bought of J. Elmes; and "Order for works £420 at Record Office", signed 5 Sept. 1716, by C. Wren, C. Dartique-nave, and Ed. Young; are also in sir J. Soane's museum. Eight letters at the Royal Society. *Office Books*, Dec. 1660 to May 1661, Harl. MS. No. 1656; 1662 and 1663, No. 1657; and Dec. 1666-May 1667, No. 1658; of this one, extracts are given in BUILDER *Journal*, 1854, xii, 567; re Tower, Rd. Gammon, clerk

of the works. Harl. MS. 4941, No. 24, and p. 169, temp. 1658 and 1688, giving Wren's signature.

ENGRAVINGS OF BUILDINGS.

C. R. COCKERELL, *A Tribute to the Memory of Sir C. Wren*, a large water-colour drawing of Wren's works, exhibited 1838 at the royal academy, 1842 engraved, and now deposited in the South Kensington museum. CIVIL ENGINEER, ETC., *Journal*, with description, v, 324-31. CLAYTON, *The Parochial Churches*, 60 pl., fol., 1848-9. GODWIN AND BRITTON, *Churches of London*, 2 vols., 8vo., 1838-9. T. TAYLOR, *Wren's Towers and Steeples*, 8vo., 1881. NIVEN, *City Churches destroyed since A.D. 1800*, 8vo., 1886. W. PEARSON, *Churches of London*, fol., 1810-12. *Threatened Churches in London*, B. J., 1879, xxxvii; *Towers*, 489, 539, 582, 730; and xxxviii, 803. WHEATLEY, *London Past and Present*, 3 vols., 8vo., 1891; replacing CUNNINGHAM, *Handbook to London*, 8vo., 1850.

INGRAM, *Memorials of Oxford*, 3 vols., 8vo., 1837. ACKERMANN, *Colleges at Oxford and Cambridge*, 4to., 1812-4. WILLIS AND CLARK, *Arch. Hist.—of Cambridge*, 8vo., Camb., 1886. BRITTON AND PUGIN, *Public Buildings of London*, 2 vols., 8vo., 1825. PYNE, *Palaces*, 4to., 1819. LAW, *Hampton Court*, 8vo., iii, 1891.

STYLE AS AN ARCHITECT.

STEELE, in No. 52 of "The Tatler", wrote the character of Wren in the form of an apologue. EAST, *On the Styles of Wren*, in CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 138. T. R. SMITH, *Life and Works of C. Wren*; in C. E., ETC., J., 1857, xx, 185-9; and another in BRITISH ARCHITECT *Journal*, 1889, p. 151, 169. PICTON, *Wren and his Church Architecture, a Study*; at Liverpool Arch. Society, B. J., 1858, xvi, 880; and xvii, 22-3. WIGHTWICK, *On the Architecture and Genius*, prize essay, 1858-9, at Roy. Inst. of Brit. Architects, *Sessional Papers*, 1857-8, p. 119-28; also in B. J., 1859, xvii, 373; 452 abridged. KERR, *Sir C. W. and his Times*, B. J., 1861, xix, 323, 331. HUGGINS, *Genius of Sir C. W.*; B. J., 1882, xliii, 327, 412, 442, 585; 1883, xlv, 307, 547, 559. *Wren as a Designer and Draughtsman*, B. J., 1889, lvii, 239. NEALE AND BRAYLEY, *Westminster Abbey*, fol., 1818-23, ii, index, animadvert on Wren's Gothic work. W. P.

WREN (CHRISTOPHER), F.R.S., the eldest son of sir C. Wren, born (16 or) 18 February 1675; educated at Eton college, and at Pembroke hall, Oxford; 1694 appointed deputy clerk engrosser in the office of works; and 5 Dec. 1702 "clericus operum", succeeding W. Dickenson; confirmed 1715 by George I; 1716 Aug. 31 he was removed for John Mercer. He composed the chief part of *The Parentalia*, or *Memoirs of the Family of the Wrens*, published by his son Stephen, assisted by J. Ames, fol., 1750; the MS. is in the library of the Royal Society. His name does not appear to be connected with any of his father's works. He died 24 August 1747, aged 72, and was buried in Wroxhall abbey church, the estate at Wroxhall having been given to him by sir Christopher on the son's second marriage, or inherited from him. A portrait by J. Faber is engraved in the *Parentalia*, 1750.

WRENCING or Twisting. See TORSION.

WRICHT (MATTHEW), mason, 14 Nov. 1493 with two others, were engaged for aye yer to remane, and abide in ther service, batht in the luge and vteuche, etc.; also in the queyr, 22 Nov. 1498; SPALDING CLUB, *Aberdeen Burgh Records*, 4to., Aberd., 1844, i, 52, 68.

WRIGHT; Wryghte, "Wrichte, a joiner. The general designation in Scotland for all who work in wood, a common carpenter". "1484, a contract for a timber house betwixt Jo. Wandesforde esquire and John Wryghte and . . . of Richmond wryghtes . . . in al kynde of wryghte w'ke"; WHITAKER, *History of Richmondshire*, fol., 1823, ii, 146. BUENTING, *Itinerary of Scripture concerning Wrights and Masons*, 1615. THE EDINBURGH NEWS for 9th October 1852. "Wright ax", and "Wright house" or carpenter's workshop; SURTEES SOCIETY, *York Fabric Rolls*, 8vo., Durham, 1859, p. 359. Arkwright, boatwright, cartwright, and wheelwright denote their respective trades.

WRIGHT (...), designed the new horse armoury on the east side of the Tower of London, 149 ft. by 33 ft.

WRIGHT (STEPHEN). In 1752-67 designed Clumber, Nottinghamshire, for Thomas Pelham, duke of Newcastle (died 1768), the stone was found on the estate; NEALE, *Seats*, 4to., 1820, iii; WATTS, *Views of Seats*, fol., 1779, pl. 29. 1753-8 made a design for the Senate house at Cambridge, of which only the library was built and the arcade; plate 1753-4 by Fourdrinier; *Complete English Traveller*, fol., 1771; WILLIS AND CLARK, *Arch. Hist.—Cambridge*, 8vo., Camb., 1886, iii, 65-6. In 1755 he held the appointment of clerk of the works at Hampton Court palace; and 25 Feb. 1758 was appointed master mason in the King's board of works, in the room of H. Fliteroft appointed comptroller; also was deputy surveyor, cir. 1770, at a salary of £90 per quarter. His name appears as "S. W., esq., architect, master mason of his majesty's works", in the list of subscribers to WOOLFE AND GANDON, *Vit. Britt.*, fol., 1767-71, which work, i, pl. 4-6, gives "His Majesty's (George II) lodge, Richmond park, as designed by R. Morris and S. Wright; and pl. 56-7, Nuthall, Nottinghamshire, for sir C. Sedley, bart. He died about 1780. W. P.

WRIGHT (WILLIAM), "architect", published *Ideas for Rustic Furniture*, etc., 8vo. (1790 ?); and *Grotesque Architecture or Rural Amusement*, 8vo., 1767, pl. of rustic designs; 28 pl. 1790; 1802; 1815.

WRITING ROOM. The mediæval term was SCRIPTORIUM. The CARREL in the cloister was also so used. In a modern residence, the MORNING ROOM, STUDY, or the library is used for this purpose.

WROUGHT. Worked into shape, or decorated by hand labour.

WROUGHT IRON, more properly MALLEABLE IRON, or BAR IRON, in its perfect condition is pure iron. It falls short of that perfect condition to a greater or less extent owing to the presence of impurities, of which the most common and injurious are sulphur, phosphorus, silicon, calcium, and magnesium. IRON; CRYSTALLISATION; OXIDATION; PLATE IRON; PUDDLING; SHINGLING; WELDING. Publications in addition to those in IRON: Mr. Booker's patent process for simplifying and accelerating the conversion of cast iron from its rude state into malleable or wrought iron, the iron being introduced or run in a fluid state direct from the refinery hearth into the puddling or reverberatory furnace; SOCIETY OF ARTS, *Transactions*, 1843, liv, 25. KIRKALDY, *Tensile Strength of Wrought Iron*, etc., 8vo., 1862; and *Relative Properties of Wrought Iron Plates*, 4to., 1876. FAIRBAIRN, *Cast and Wrought Iron for Building Purposes*, 8vo., 1870. ADAMSON, *Mechanical and Other Properties of Iron and Mild Steel*, 8vo. Specification for wrought iron work for building purposes, in BRITISH ARCHITECT *Journal*, 24 Dec. 1886, p. 606.

WROUGHT IRON BEAM AND GIRDER. BARTON, *Economic Distribution of Material in the Sides*, etc., read at Institution of Civil Engineers, *Transactions*, 1855; and CIVIL ENGINEER, ETC., *Journal*, xviii, 211. T. DAVIES, *Wrought Iron Beams*, *idem Journal*, 1857, xx, 20-2, referring to TATE, *Strength of Materials*, 8vo., 1850; and FAIRBAIRN, *Useful Information for Engineers*, 3 vols., 4th. edit., 8vo., 1864-66. TARN, *Strength of Wrought Iron Plate Girders*, in *BUILDER Journal*, 1853, xi, 646, 677; and *Comparison of Strengths* (marked discrepancy), *idem*, 1863, xxi, 247. Smart's wrought iron beam in SOCIETY OF ARTS, *Transactions*, 1827, p. 126; MALLET, *Co-efficients of Elasticity and Rupture in Wrought Iron*; at INSTITUTE OF CIVIL ENGINEERS, *Transactions*, 1859; *BUILDER Journal*, xvii, 224. BRIDGE. ROOF. GIRDER. KANARUC, and INDIAN ARCHITECTURE.

WROUGHT IRON ORNAMENTAL WORK. This has been treated s. v. IRON WORK. CLARKSON, *Ancient Ironwork from xiii century*, fol., 1860. "Old English Examples" in CIVIL ENGINEER, ETC., *Journal*, 1851, xiv, 615. A good collection in the Weston museum at Sheffield. PENSTONE, *Work of the Smith in xvi, xvii, and xviii cents.* in *BUILDER Journal*, 1879, xxxvii, 593, 634; and *BUILDING NEWS Journal*, 1879, xxxvi, 613-6.

WROUGHT IRON WINDOW. Entire frames of iron are made for warehouses, asylums, breweries, churches, schools, mills, and other public purposes. **WEATHER TIGHT; WINDOW of iron.**

WROUGHT STONE. See **ASHLAR.**

WUERZBURG, Wurtzburg, Wirtzburg. One of the most ancient cities of Germany dating from VII cent. Ceded to Bavaria in 1796. Situated on the river Main, over which is a stone bridge 600 ft. long, 1476-1607 adorned with twelve statues of saints; shown in *P'out, Facsimiles of Sketches in Flanders, etc.*, fol. (1837). The city, which ceased to be a fortress in 1866, is a fine specimen of the municipal architecture of the middle ages; twenty towers and spires are seen, nine of which seem close together in the centre, in a group. The see was founded upwards of 1,100 years since and 82 bishops have successively presided. The cathedral, dedicated to S.; the crypt under the choir may be 862; the church is an extensive cruciform basilica, romanesque 1042; consecrated 1189, or 1189-1230, embellished 1240 of which date are the four towers. 1133 occurs a contract between the bishop Embricho and the lay master mason Enzelin or "Enselimes laycus", of **LENOIR**, *Arch. Mon.*, 4to., Paris, 1852, i, 35 (**LAICUS**); **REICHENSPERGER**, *Die Bauhütten des Mittelalters*, 8vo., Cologne, 1879, p. 12; **GOULD**, *History of Freemasonry*, 4to., 1882, i, 116; who 167, notices the two pillars of peculiar shape standing within the building (which may have originally formed part of the porch); a sketch in **STEINBRENNER**, *Origin, etc., of Freem.*, 12mo., New York, 1864, p. 79. 1331 H. Heckris was *baumeister*; about 1331-93 Arnold von Rothenstein; 1393 Gottfried; 1424 Wolfram of Koenigsberg completed (?) the works; 1482 Orlolf Gross; 1499 Konz Kol; 1678 C. Spoerer; 1800 *cir.* the chapter-house restored by P. Speeth. The edifice modernised since 1700, restored 1842. The rich domed chapel of bishop Schönborn (died 1721). Two fine upright monuments 1495 to R. von Scherenberg, and 1512 to bishop von Bibra, both by Tilman Riemenschneider (**BUILDER Journal**, 1877, xxxv, 1055 and 1102). A brass of 1522. A curious bronze font 1279 (*idem*, 1867, xxv, 820, 834). Part of the old cloisters was discovered built in a wall (*idem*, 1883, xlv, 179-82 view); the present one is one of the few examples of purely Perpendicular tracery found out of England and peculiar vaulting. Of the thirty-three churches many are not in use, and others devoid of interest. Neumünster kirche or of S. Kilian, dating from before 854; crypt under the very long choir *cir.* 1000; east end and octagon tower *cir.* XIII cent.; some very early stall work; the western crypt, under the dome, may date 854, but all restored 1730 in the Jesuit style, also the date of the dome and lantern; the façade baroque (B. J., 1884, xlv, 440). On the north side are the remarkable cloisters. Liebfrauen- or Marien-kapelle, very fine, 1377-1409, Eberhard Friedberger and meister Weltz, *steinmetz*; portal and slender tower 1377-1479; restored 1857; the statues near the south portal and in the choir are by T. Riemenschneider; B. J., 1881, xli, 172. Stifthaug church, S. John Baptist, or S. John im haug, 1670-83, with two towers and lofty dome (Italian) by Petrini of the town, B. J., 1881, xli, 25. S. Burkardus church, nave 1033-42; choir xv cent.; the chancel raised over a street; interior altered, but its romanesque exterior remains; the spires show a singular and early use of the crocket; some fine stalls. S. Michael restored by J. A. Gaertner, *cir.* 1800. Neubaukirche, 1591 and later. Church to the Vierzehn heiligen; T. Nistler, with his two stepsons, Caspar and Sebastian Weber worked for thirty years as master of the works. The Hauger pfarrkirche, classical; the Franciskaner kirche, with others, are described in **WEBB**, *Continental Ecclesiology*, 8vo., 1848, p. 97-101. The Deutsch haus church is a good specimen of XIV cent. work with a good doorway. Protestant church of S. Stephen dates 1789.

The court-house, *rath haus*, oldest part 1456, and XVI cent. View and angle bay-window, in B. SMITH, *Sketches in Germany*, etc., fol., 1880, pl. 7 and 29. House of Zum Falken in rococo style. Bishop Zobel's pillar, *cir.* 1558 (B. J., 1882, xlii, 231). Julius spital; extensive having a range of 62 windows in front,

with hospital and school of medicine, founded by bishop Julius Echter von Mespelbrunn, in 1572, and died 1617; his statue in front is by Schwanthaler. University founded 1582 by the same bishop, contains collections of works of art and a library of 100,000 volumes; its church has an observatory on its lofty tower. The large palace (284 apartments) formerly the episcopal residence erected 22 May 1720-44 by two bishops Schönborn, in imitation of the palace at Versailles, 270 ft. long and 60 ft. high, by Petrini, who was succeeded by J. B. Neumann to whom the chapel only is attributed; the plans appear to have been modified by R. de Cotte and G. de Boffrand (**DUSSIEUX**, *Artistes Français*, 8vo., Paris, 1851, p. 101); the good staircase is given in **ILLUSTRATED LONDON NEWS**, 1845, vii, 172; **BUILDER Journal**, 1882, xlii, 610-2; and **BUILDING NEWS Journal**, 1888, lv, 522: the cellars under one wing, stated to hold 4,000 casks, or 2,200 tuns, or 10,000 gallons, date from 1784, and are probably the most spacious in Germany. Maxschule (Gothic), the commercial and grammar schools with the collections of the polytechnic and historic society. The house of correction was *cir.* 1800 commenced by P. Speeth, but finished by the government of Bavaria. Conservatories in the Botanic gardens; **ALLGEMEINE BAUZEITUNG**, 1860, pl. 321 and 335. The "three crowns" inn, B. J., 1886, l, 914. P. Speeth also restored the schneid thurm and the gate tower in the zeller strasse. The theatre *cir.* 1800 by J. A. Gaertner, who also designed many buildings in and around the town, and restored count Schönborn's château at Gaibach.

The citadel or fortress of Marienberg, erected 1650 on the site of one of the 50 forts of Drusus, was afterwards an episcopal castle, has a round church and oblong chancel of x or xi cent. date; the floor covered with effigies of bishops and priests. The Nicolaus capelle on a hill close by it was built 1650 for a place of pilgrimage; many chapels with stations on the ascent to it. At Heildingsfeld; an iron gate 1510 in Gothic style, **HEFNER-ALTENEK**, *Serrurie*, fol., 1869, pl. 80. **REINHARDT** and **SCUBERT**, *Architectonische Reise Studien—aus W.*, fol., Berlin, 1880. *Allemanque Mont. et Pitt.*, fol. **BREWER**, in **ROY. INST. OF BRIT. ARCHITECTS**, *Sessional Papers*, 1867-68, p. 144-6. 14. 28. 50. 96.

WUEST (...) with Stengel; 1768 began the church of S. Isaac at S. Petersburg; completed 1802 by V. Brenna.

WULFSTAN, Wulstan, Wolstan, and Wlstan (**SAINT**). He was born 1007 or 1008 at Ictune (now Long Ichington), Warwickshire, educated at Evesham, and at Peterborough where his master Ervenius or Erwin was skilful in illuminating books. He became a monk of Worcester, 1050 prior, and 1062 was appointed bishop by Edward the confessor on the nomination of Aldred, then archbishop of York. He restored the half-demolished church at Westbury; the commandery at Worcester as a hospital for travellers; and almost rebuilt his cathedral, of which still exist the crypt, wherein the great synod of 1092 was held, the walls of the transepts, outer walls of the nave aisles but much altered, several doorways, the western severys of the nave, and other details; he died 18 or 19 January 1095, aged 86 or thereabouts; **BRITTON**, *Worcester Cath.*, 4to., 1835, p. 15, 32; **ASHPITEL**, at Worcester meeting of the British Archaeological Association, 1848, p. 98. **HOOK**, *Life*, in **ARCHAEOLOGICAL JOURNAL**, 8vo., 1863, xx, 1-28. William of Mahnesbury, in *De Gestis Pontificum*, and another *Life*, in **WHARTON**, *Anglia Sacra*, ii, 241. **WRIGHT**, *Biog. Britt. Literaria*, 8vo., 1842-6, i, 14.

WULRICH (**JOHN**). See **WOLRYCH** (**J.**).

WUMMIL. An auger; see **WIMBLE**.

WURZBURG. See **WUERZBURG**, in Germany.

WYATT (Benjamin), of a family dating from 1562 in the register at Weeford, near Lichfield, Staffordshire, "farmer and timber merchant", was resident at Blackbrook. A small engraving of the "Stafford general infirmary" is inscribed "B. Wyatt and sons, archt."; it was erected 1772 or 1777. He had seven sons; of these I. SAMUEL, born 1737, died 1807, who had a daughter not married; II. JOSEPH, 1739- before 1818, who had a son JEFFREY (sir Jeffrey Wyatville), 1766-1840; who had a son G. G., died after

1832, and a daughter [married Knapp] who died 1825; III. BENJAMIN, 1745-1818; who had LEWIS WILLIAM, 1778-1851, and three other sons; and IV. JAMES, 1746-1813, who had BENJAMIN DEAN, 1775-1852?; two other sons; and PHILIP,-1836.

WILLIAM Wyatt, a brother of this Benjamin, was steward to the earl of Uxbridge, and lived at Shropnall, near Burton-on-Trent: "and from these two are descended several branches of this most numerous family", SHAW, *Staffordshire*, fol. 1798-1801, i, p. 24, who states (i, pt. ii, 13) that SAMUEL was the son of the brother of this Benjamin, but this is an error. THOMAS HENRY and sir M. DIGBY are descended from this William (see later).

These memoirs have entailed much reference and comparison, as there are none of any authority; and the buildings are attributed by writers to one or more of the brothers. "N." refers to NEALE, *Seats of the Nobility*, etc., two series; "W." to WATTS, *Vicars of Seats*, fol. 1779; "T." to TWYCHROSS, *Mansions*, etc., 4to., 4 vols., 1849-50; and "A." to ACKERMANN, *Repository of Arts*, three Series.

WYATT (SAMUEL), born 8 Sept. 1737 at Blackbrook, was the third son of Benjamin of Blackbrook. Designed 1778 Hooton hall, Cheshire, for sir T. S. M. Stanley, bart. (belonging in 1850 to R. C. Naylor, esq.); of Storeton stone; N., 1829, 2 ser., v; T., iv, 51; W., pl. 23; and 1777-80 Doddington hall, Cheshire, for sir J. D. Broughton, bart.; LYSONS, *Cheshire*, 4to., 1810, 829; N., 1829, ser. 2, v; T., v, 13; RICHARDSON, *Vit. Britt.*, fol. 1802, pl. 60-2. In 1779 he was "a builder of No. 63, Berwick street" (HIGGINS, *Cements*, 8vo., 1780, p. 182), and he with JAMES, carried on 1788-6 the carpentry and building speculation of the Albion Mills, Blackfriars; built Albion Place, and lived in the house at the corner of the mill, which was burnt 3 March 1791 by incendiaries; SMILES, *Lives*, etc., 8vo. He was the inventor of the "sympathetic hinge". As an artificer of the board of works, he performed 1779 the carpenter's work at the rebuilding of the chapel of Greenwich hospital under J. Stuart and W. Newton (NICHOLSON, *Dict. of Arch.*, s. v. Roof, p. 51); also 1782 at Somerset house under sir W. Chambers; 1784-5 the commissioner's house in the dockyard at Portsmouth, where he employed T. Telford; RICHARDSON, *Vit. Britt.*, fol. 1808, ii, pl. 22-3. Hurstmonceaux, Sussex, built 1426, had been purchased by Mr. Hare Naylor, and being found very dilapidated, much of it was dismantled under Samuel, who designed (and built) a modern house with the old materials (DALLAWAY, *Discourses*, 8vo., 1833, p. 330, who in his *Anecdotes*, 8vo., 1800, p. 62, says it was done by Jeffry); 1793 Sept. 12—97, Trinity house, Tower hill (usually called his only work and claimed by James); a good print in the British museum, the King's collection, and in CROWLE'S *Pennant*, x, 16; MALTON, *London*, etc., fol. 1799, ii, p. 91, pl. 82; and "bureau de péage on the Thames", in STEIGLITZ, *Plans*, etc., fol. Paris, 1801, pl. 78; RICHARDSON, *Vit. Britt.*, 1802, i, pl. 23-5. "Design for the front of the theatre at Birmingham, coffee-house, etc.", a drawing in indian ink, British museum, the King's collection. Kimmel park, Denbighshire, burnt 1842, rebuilt by lord Dinorben. Baron hill, Beaumaris, for lord Bulkeley, Holderness house, Park lane, with his nephew BENJAMIN DEAN. Kedleston, Derbyshire, completing it for lord Scarsdale. 1797 Penrhyn castle, Carnarvonshire, with his nephew LEWIS WILLIAM. 1805? Tatton park, Cheshire, for Wilbraham Egerton, esq.; LUDON, *Repton's Works*, 8vo., 1840, p. 47; which was completed by LEWIS before 1823; the lodges were by J. Hakewill. N., 1818, i. A., 1823, 2nd ser., ii, 125. He was appointed 5 March 1792 clerk of the works at Chelsea hospital; where he died 8 February 1807, aged 70, and was buried in the burial-ground attached; he was succeeded by J. Soane. He is mentioned as having examined Chelmsford barracks, in the *Fourth report of the Commission on military enquiry*, 1806, p. 137, 282. John Harvey was a pupil. W. P.

WYATT (JOSEPH), born 9 Oct. 1739, fourth son of Benjamin of Blackbrook, was an architect of Burton-on-Trent, Staffordshire. He died before 1818.

WYATT (JEFFRY), his son, was born 3 Aug. 1766 at Burton-on-Trent. He exhibited at the royal academy from 1786 to his election as A.R.A. in 1823 and R.A. in 1826 when he sent his Windsor designs; the "Priams" palace 1798, and many similar classic designs later are recorded as having had much merit. From about 1784 to 1791 he was with Samuel at 63, Berwick street, and 1792-99, with James, in Queen Anne street; in 1799 he settled in Avery Row on commencing practice, and at same time became partner with John Armstrong, an extensive builder of Pimlico, carrying out government works, up to about 1824; who made Jeffry's coffin at his request in 1840. 1788 he did the carpenter's work at the installation of the Knights of the Bath at Westminster abbey and at Ranelagh; Accounts Brit. Mus., Add. MS. 6327.

1799 Alterations at Woolley park house, Berkshire, for revd. P. Wroughton; RICHARDSON, *Vit. Britt.*, fol. 1808, pl. 38-41.

1799 Bladon hill, Burton-on-Trent, for A. Hoskins.

1800 Charity school for countess Conyngham in Ireland.

1800 Market house at Slane, Ireland.

1801 East end of a terrace at Burley-on-the-hill, for lord Winchilsea.

1801-11 Longleat, Wiltshire, for marquis of Bath; new entrance, added one side of the great court and a cloister around it, a grand staircase, stables and conservatory, to the house of 1567-79. 1814 garden buildings. N., 1822, v. KERR, *Gentleman's House*, 8vo., 1871, pl. 14.

1802-6 Nonsuch park, Surrey, for S. Farmer, esq., following the style of the palace of Henry VIII; BRAYLEY, *Surrey*, 4to., 1841, iv, 410-1.

1804 Wollaton hall, Nottinghamshire; alterations for lord Middleton, including the great hall, 70 ft. long and 70 ft. high, 1824 new lodges; BRITTON, *Arch. Antiq.*, 4to., 1778, ii, 109. N., 1821, iii.

1805 Hillfield lodge, Herefordshire, for hon. G. Villiers.

1808 Rowd Aston, Wiltshire, for R. Long, esq., M.P.

1808 A house in Hampshire.

1808 Lodge at Roche court, for sir J. S. W. Gardiner, bart.

1809 Lypiat . . . for P. Wathen, esq.

1809 Thurland castle, for R. North, esq., chapel and entrance court.

1809 Reported on the insecurity of the tower of S. George's church, Liverpool; PICTON, *Municipal Records*, 8vo., 1886, ii, 398.

1810 Gothic house in Westmoreland.

1810-1 Eudsleigh, Devonshire, for John Russell, duke of Bedford; a cottage ornée; N., 1818, i. A., 1828, xii, 2.

1811 Belton house, Lincolnshire, for lord Brownlow; erected 1685-9 by sir C. Wren; a greenhouse and dairy; 1816 Belton church and the sepulchral chapel for earl Brownlow. (See JAMES, 1776.)

1811 Badminton, near Bath, Gloucestershire, for duke of Beaufort; new dining-room and library to house of 1682. N., 1825, Ser. 2, ii. ILLUSTRATED LONDON NEWS, view, 1845, vi, 92.

1811 A monumental tower in Lincolnshire.

1812-3 Bradby or Bretbey hall, Devonshire, for earl of Chesterfield, chapel, library, octagon, kitchen, etc.

1813 Government house for Quebec, Canada.

1814-20 Ashridge, Buckinghamshire, for earl of Bridgewater and later lord Brownlow. North entrance and east wing completing the works of his brother JAMES (1808-16); column in the park; screen, stalls and organ in chapel; N., 1829, Ser. 2, v. A., 1828, xi, 3 ser., 1.

1814 Hinton S. George, Somersetshire; for earl Poulett, entrance.

1815 Bretton hall, near Wakefield, Yorkshire, for col. Beaumont; considerable alterations, pheasantry, aviary, etc.; N., 1821, v.

1815 Hyde park, cascade at . . . end of the Serpentine.

1816 Stubton villa, Lincolnshire, for sir R. Heron, bart.

1818-20 Woburn abbey, Bedfordshire, for duke of Bedford; Temple of the Graces; the verd antique columns from ruins at Rome, etc.; formed Holland's conservatory into the sculpture gallery. A., 1824, 3rd ser., iv, 247-52. ROBINSON, *Vit. Britt.*, fol. 1827, p. 16.

1819 Gopsall, Staffordshire, for earl Howe; new entrance lodge, etc.

1820 Banner cross, Yorkshire, for general Murray.

1821-32 Chatsworth, Derbyshire, for duke of Devonshire; added the north wing including the picture gallery and tower, the Sheffield and Derby entrances, alcove in the gardens, dairy, etc.; N., 1813, i. Holmes was the clerk of the works, who left Windsor. Also the Village in the park. ILLUS. LONDON NEWS, 1843, iii, 376. Plans, etc., in *The Peak Guide*.

1821 Sydney Sussex college, Cambridge; surveys, etc.; 1824 made new designs; 1831-32 carried out new fronts to the whole, repaired and altered the centre buildings, new gatehouse, north wing of front court, repaired south wing of chapel court, new combination room; cost £13,063; WILLIS AND CLARK, *Arch. Hist.—Cambridge*, 4to., 1886, ii, 741, 748.

- 1822 A club house.
 1822 Whitley Wood hall, . . . for sir C. Scott, bart., a greenhouse.
 1822 Village school for the marquis of Bath.
 1824 At Yester, . . . for marquis of Tweeddale, keeper's lodge.
 1824 Windsor park, gamekeeper's cottage.
, Wiltshire, for sir Paul Methuen.
 Lilleshall, Shropshire, for earl Gower.
 Golden Grove, Carmarthenshire, for earl of Cawdor.
 Dinton, Wiltshire, for William Windham, esq.
 Denford, Berkshire, for William Hallett, esq.
 Trebursye, Cornwall, for hon. William Elliott.
 Wimborne, Dorsetshire, for William Castleman, esq.
 Claverton, Somersetshire, for John Vivian, esq.
 Hastings, Sussex, for comte de Vandea.
 Browsholm hall, Yorkshire, for . . . ; the dining hall; WHITAKER, *Whalley*, fol., 1818, p. 237.
 S. James's palace, additions approved, before 1838.
 Chillingham castle, Northumberland, for lord Tankerville.
 Brancepeth castle, Durham, for . . . now lord Boynes; restorations.
 Messrs. Scott's bank, Cavendish square.
 1837 Kew gardens; Pantheon temple, for William IV.
 1837-8 Kew Green; chapel of S. Anne (1714) enlarged.

1824-40 at Windsor castle, for king George IV, king William IV, and queen Victoria, where he completed the quadrangle and perfected the entrance or George III's staircase begun by his uncle James; finished some rooms and added others to the suite of domestic and state apartments, the gallery adjoining them, rebuilt and added to many of the towers, rebuilt the Brunswick tower, the tower over the carriage drive near the state rooms, and other portions of the terraces, bringing the whole exterior into a unity of design; added about 33 ft. to the keep or Round Tower. ASHTON and POYNTER, *Windsor Castle*, fol., 1841; and GANDY AND BAUD, *Architectural Illustrations*, fol., 1842. In 1838-9 exhibited the towers and upper ward in five drawings; and 1839 designed the royal stable, completed 1842 under H. Ashton. The works are described in *ARCHITECT Journal*, March 20, 1891, xlv, 174. TIGHE AND DAVIS, *Windsor Castle*, 8vo., 1858, ii, 599-644. On 12 August 1824, as an honorable augmentation, his name was changed to "Wyatville" on the laying the first stone by the king of the new, or George IV's, gateway of this restoration, and 9 Dec. 1828 was knighted on the king taking possession of the castle after the restorations (WINDSOR CASTLE). His official residence was in the Winchester tower, which he was allowed to retain until his death: his town residence was at No. 49 and then No. 50, Lower Brook street from 1804 until death. He made a design for the schloss Altenstein, Altenberg, for duke of Saxe-Meiningen; and another for a ducal residence in Meiningen with large stables and riding-house, for which he received the grand cross of the Saxon Ernestine order. Among his pupils were C. Parker; W. J. Donthorne; W. Harris; Ed. Haycock 1807-10; J. T. Wood 1798-1802; H. Lester 1821; H. Ashton; his son G. G. Wyattville exhibited 1832; B. Baud; Michael Gandy was in his office for thirty-three years up to 1840.

His portrait painted by sir Thos. Lawrence, P.R.A., is at Windsor. He died 18 February 1840, aged 73, in London, and was buried 25 Feb. in a vault in the east aisle and behind the altar of S. George's chapel, Windsor. CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 130, from memoir by JERDAN in Fisher's National Portrait Gallery, 1830-4. Literary World, Art Union Journal, Athenaeum, etc. SURVEYOR, ENG. AND ARCHITECT *Journal*, by Mudie, 4to., 1840, i, 61-2. W. P. 14.

WYATT (BENJAMIN), born 14 January 1745 in London, fifth son of Benjamin of Blackbrook; had four sons including LEWIS WILLIAM. He died 5 January 1818, aged 73, at Lime Grove, near Bangor. GENTLEMAN'S MAGAZINE, lxxxviii, pt. i, 89.

WYATT (LEWIS WILLIAM), born 1777 or 1778, fourth son of this last-named Benjamin. His name first appears 1793-6 at Samuel, his uncle, of No. 63, Berwick street. He exhibited 1797 a view of Penrhyn castle, Carnarvonshire, and views of buildings executed on the estate; 1798 others, intended ARCH. PUB. SOC.

for publication. 1800 (at Mr. Wyatt's). 1801 competed for London bridge. 1802 a public building. 1804-6 competed for Downing college, Cambridge (31 Charlotte street, Portland place). In 1806 was assistant to James Wyatt at the Board of Ordnance (*Fourth Report of Commission of Military Enquiry*, p. 288). 1808 Wemyss castle; gateway and lodge. 1810 Wingham, for right hon. viscount Templeton. 1810 Hackwood, near Basingstoke, for right hon. lord Bolton; south front only; A., 1825, 3rd ser., vi, 125. 1811 Tatton park, Cheshire, for W. Egerton, esq., entrance gateway, etc., and conservatory, completing the works after 1807 of (his uncle) Samuel. 1812 Stoke, Notts, for sir R. Bromley, bart. (1813 in the Albany, with G. Wyatt.) 1814 Stockport parish church, Cheshire. 1816 Lyme hall, Cheshire, for Thomas Legh, esq., M.P. (built 1726-32 by G. Leoni); north front, alterations to the Elizabethan work; exhibited the four fronts 1816; N., 1824, Ser. 2, i; T., v, 92-8. 1818 June, was appointed a clerk of the works in the Office of Works, and engaged at Hampton Court palace, and a Kew. He also designed Willey park, Shropshire, for lord Forrester; N., 1825, ser. 2, ii. Cuerden hall, Lancashire (built 1717 for Baunestre Parker, esq.), important additions for R. T. Parker, esq.; T., i, p. 42. Oulton hall, Cheshire, for sir P. de M. Grey Egerton (1716 by sir J. Vanbrugh), interior altered and terrace added; T., iv, 106. 1822 (at the Albany) exhibited the north-west elevation of Dungeness lighthouse, struck 23 Dec. 1821; and 1827 (at 13 Suffolk street) design for S. George's hospital. 1836 competed for the houses of parliament. He retired to his property Puck Pool, Isle of Wight, and died there 14th February 1853, "aged 75". GENTLEMAN'S MAGAZINE, 1853, p. 670. W. P.

WYATT (JAMES), sixth son of Benjamin of Blackbrook born 3 August 1746 as usually stated, at Burton Constable; became a pupil of W. Atkinson, was taken by lord Bagot to Rome, where he studied the antiquities; then to Venice, where he became a pupil for two years of Visentini. In 1766 (or later) he returned to London, for in 1770 he designed the Pantheon, Oxford street, opened 22 January 1772, which cost £60,000, and for which he received high encomiums and became known: in it he introduced scagliola; it was burnt 14 January 1792. The Poland street façade was put up 1800. A print 1772 of the interior by Earlom. EUROPEAN MAGAZINE, 1784, p. 323, shows the arrangement for the Handel festival. A., 1814, xi, 42. WHEATLEY, *London Past and Present*, 8vo., 1891. This was the first work (living in Great Newport street) 1770 exhibited by him, in three views at the royal academy; and the later works are preserved together with the years, as authenticated designs—

- 1771 Ceiling at Hagley, Staffordshire, for Asheton Curzon, esq.
 House for a nobleman in Sussex.
 1772 Heaton house, near Manchester, Lancashire, for sir Thomas Egerton, bart. (later first earl of Wilton). T., iii, p. 63. N., 1824, ser. 2, i.
 Garden pavilion for a nobleman in Derbyshire.
 1773 A ceiling.
 1774 (Residing in Newman street), a house; and a house for a gentleman in Staffordshire.
 1788 Cobham park, Kent, for the earl of Darnley. The great hall, vestibule, picture-gallery and dining-room; also the mausoleum, STRIEGLITZ, *Bulle Arch.*, fol., Leipzig, 1800, pl. 98. N., 1819, ii.
 1785-8 Wynnstay, Derbyshire, for sir W. W. Wynn, bart.; the fluted column, 100 ft. high, for a memorial to his predecessor.
 1786 (At Queen Anne street east), a lodge.
 1787 Salisbury cathedral; altar-piece and screen; (1782-91 destroyed the monumental chapel, and placed the fragments between the columns of the nave).
 1794 Villa; west and east front; hall and staircase.
 1795 Oxford; Magdalen college; 1793-5 new roof to chapel and hall.
 1795 Mausoleum (1787-95) at Brocklesby, Lincolnshire, for Charles Pelham, lord Yarborough; published by TATHAM, fol., 1811; print by F. C. Lewis after J. W. Turner; ALLEN, *Lincolnshire*, 4to., 1884, ii, 230. ARCHITECT *Journal*, 1850, ii, 138.
 1791 Lincoln's Inn chapel; repaired; new roof and new east window.
 1796 Bowden house, Wiltshire, for B. Dickenson, esq.; RICHARDSON, *Vit.*

- Britt.*, fol., 1802, i, pl. 1-2; *BRITTON, Wiltshire*, 8vo., 1812, iii, 244 (who states that it was by Samuel).
- 1796 King's college, Cambridge, design for new front.
- 1796 Cornham house, Wiltshire, for P. C. Methuen, esq.; alterations.
- 1796-9 Fonthill abbey, Wiltshire, for W. Beckford, esq., and 1822-3 to John Parquhar, esq.; cost £150,000. *BRITTON, Illustrations*, fol., 1823. *RUTTER, Illustrated History, etc.*, 4to., Shaftesbury, 1823. *GENTLEMAN'S MAGAZINE*, 1807, lxxvii, ii, 880. N., 1824, 2nd ser., i.
- 1798 Dodington park, Gloucestershire, for Chr. Codrington, esq.; *FOSBROKE, Gloucestershire*, fol., 1807, ii, 23.
- Approximate dates only have been obtained for the following; the first three are attributed to him, but are too early if the dates be correct.
- 1745 (?) Gidea hall, near Romford, Essex, for R. Benyon, esq., a bridge of three elliptic arches.
- 1755 *cir.* The front to White's club, Nos. 37 and 38, S. James's street.
- 1757 Copped hall, Essex, for John Conyers; improvements, of white brick; *BRAYLEY, Beauties of England and Wales*, 8vo., 1803, p. 431.
- 1773-5-83 Oxford; Christ Church college. Canterbury court, north and east sides rebuilt; hall repaired; 1783 south side; 1778 the Doric gateway; 1800-1 new stairs, etc., lobby and other works.
- 1775-95 Oxford; advised on the observatory by H. Keene, died 1776; and materially altered and completed by him 1786.
- 1775 Durham cathedral. A general repair commenced (1796, the chapter-house nearly demolished by the then chapter architect).
- 1775 *cir.* Bishop Auckland palace; Gothic gateway and screen at entrance, 310 ft. long; *ROSE, Northumberland*, 4to., 1832, i, 57. [1811].
- 1776 Belton house, Lincolnshire, for James lord Brownlow (see *JEFFERY*, 1778-9 Grosvenor square; on south side for Mr. Delvine; Higgins' cement used).
- 1779 No. 9, Conduit street, Hanover square; for Mr. Viner. Higgins' cement used. (Now the Architectural Union Company's premises.)
- 1780 Oxford; Brasenose college; interior of library renewed, etc.
- 1782 Lee priory, near Canterbury, Kent, for T. B. Brydges Barrett, or Thos. Barrett, esq. "His first work in the old English style", for a residence; *PUGIN, Specimens*, 4to., 1821, i, xvii. *HASTED, Kent*, *BRITTON, Arch. Antiq.*, 4to., 1826, v, 80. N., 1825, 2nd ser., ii.
- 1782-4 Pishiobury, Hertfordshire, for Jer. Mille, esq. (later Henry Coldicut, esq.), on site of the house by I. Jones. N., 1819, ii. *NOTES AND QUERIES*, 1867, 3rd ser., xii, 525.
- ... (?) Swinfen hall, near Lichfield, for J. Swinfen, esq.; an early work of repute.
- 1782-91 Salisbury cathedral; see 1787 previous list.
- 1783 Kentish Town episcopal chapel, Lower Craven place; rebuilt 1842.
- 1784 Westminster abbey. Arrangements for the Handel commemoration. *EUROPEAN MAG.*, May 1784, p. 361.
- 1784 Sudbourne hall, Suffolk, for the fourth marquis of Hertford.
- 1784 Cambridge. Competed for Downing college; and 1800 appointed architect, but superseded by W. Wilkins; *WILLIS AND CLARK*, ii, 758-8. *HOPE, Observations on the Plans*, 4to., 1804.
- 1785 *cir.* Leinster house, Dublin. Over the supper-room is the picture gallery decorated by Mr. Wyatt; *MALTON, Dublin*, fol., 1792-9.
- 1785-8 Petworth county prison (altered by Money penny 1816). *DALLAWAY, West Sussex*, 4to., ii, pt. 1, 2 plates.
- 1788 Liverpool; the Exchange; Foster's plan reported upon; Wyatt to prepare the drawings at 5 per cent. and travelling expenses. *PICTON, Municipal Records*, 4to., 1886, ii, 265-8, 272. *ILL. LONDON NEWS*, 1847, xi, 320. Stone from Toxteth park.
- 1788 Westminster abbey. Installation of the Knights of the Bath. Jeffrey Wyatt, carpenter, and at Ranelagh. *Accounts, Brit. Mus., Add. MS.* 6327.
- 1788 Oxford; Oriel college; Ionic screen, and library, 83 ft. by 28 ft. by 28 ft. high, with common-room under.
- 1788-97 Hereford; rebuilt the nave after the fall of the tower and front; 17 April 1786; *BRITTON, Cathedral*, 4to., 1831.
- 1788-94 S. Peter's church, Manchester; the tower 1824, by F. Goodwin; whole 1860 redecorated by E. Salomons. *B. J.*, 1860, xviii, 575.
- 1788-95 *cir.* Lichfield cathedral, incorporating the lady chapel with the choir; imitation vaults of the nave (except the two westernmost and the first eastern); *BRITTON, Cathedral*, 4to., 1820.
- 1789 Oxford; New college. Restored east end of chapel, new roofing, choir enlarged, seats canopied; and fittings to library.
- 1790 Castle Coole, co. Fermanagh (Greek), for S. L. Corry, earl of Belmore; *RICHARDSON, Vit. Britt.*, fol., 1808, ii, pl. 70-5. *BREWSTER, Edinb. Encey.*, 4to., 1830, pl. 180, p. 650. N., 1829, 2nd ser., v. *Offices, cir.* 1828 by sir R. Morrison.
- 1790 *cir.* Gresford, near Wrexham, for John Parry, esq.; *AIKIN, Manchester*, 4to., 1795, p. 401.
- 1792 Frogmore, near Windsor; "the queen's house", alterations for queen Charlotte, and bequeathed to the princess Augusta; with the ruins; A., 1823, 3rd ser., i, 125-8. *PYNE, Royal Residences*, 4to., 1819, i.
- 1792 Oxford; Balliol college; library renovated; hall *temp.* Richard II disfigured; *B. N. J.*, 1857, iii, 5.
- 1793-5 Oxford; Magdalen college; new roofs to chapel, and hall.
- 1795 Chiswick, Middlesex, for the third duke of Devonshire; altered and wings added to the house; N., 1829, 2nd ser., v. W., pl. 30 and 50.
- 1795 *cir.* Stoke Pogis park, co. Bucks., for John Penn, esq., 1789-90 by R. Nasmith, entirely altered by Wyatt; A., 1824, 3rd ser., iii, 313.
- 1795 *cir.* Sundridge park, Kent, for C. or S. Scott, esq., M.P., after works by Repton, and followed 1799 by J. Nash; N., 1829, 2nd ser., v.
- 1796-1800 Windsor castle, Berkshire. Alterations to the north elevation, the Gothic staircase, Blenheim tower, and other parts. 30 Sept. 1800 a wing ordered to be decorated as soon as possible; *GENTLEMAN'S MAG.*, 1800, lxx, 892. Later works carried out by Jeffrey Wyatt. *PYNE, Royal Residences*, 4to., 1819, i, 87, 172.
- 1797-9 Henham or Hovingham hall, Suffolk; for earl of Stradbroke (1778 by sir R. Taylor for sir G. Vanneck, lord Huntingfield); west end added, etc. It was greatly damaged by fire 27 Feb. 1867. Front 200 ft. long. N., 1821, iv.
- 1796-7-1805 Woolwich common; royal military academy (castellated); 600 ft. front; cost £150,000.
- 1796-7, 1802-8 Artillery barracks, 1,200 ft. by 900 ft.; new riding-school 150 ft. by 63 ft.; also ascribed to Jeffrey Wyatt; *IRELAND, Kent*, 8vo., 1830, iv, 670-1.
- 1798 Whitehall, Banqueting house; staircase added at the north end.
- 1798 before, Canwell hall, Staffordshire; £60,000 about; new wings; filling up ground, large pillars admirably painted in imitation of Italian work by W. Dixon, who has since executed similar ones in Mr. Boulton's dining-room at Soho; *SHAW, Staffordshire*, fol., 1798-1801, ii, p. 22.
- 1798 Swinton park, Yorkshire, for W. Danby, esq., the drawing-room built by J. Foss of Richmond; N., 1828, 2nd ser., iv.
- 1799 Stoke Pogis, Buckinghamshire; the tomb to T. Gray the poet. Stoke Park, Bucks., for John Penn, esq., rebuilt by late ... Nasmith and completed by J. Wyatt; N., 1818, i. A., 1824, 3rd ser., v, 313.
- 1800 House of Lords; constructed within the old court of requests (or white hall); *BRAYLEY AND BRITTON, Palace*, 8vo., 1836, p. 401.
- 1800 *cir.* Great Marlow, Bucks.; market house.
- 1800 *cir.* Wilton house, Wiltshire, for earl of Pembroke; additions for sculpture and painting. N., 1822, v. *BROOKE, Gardens of England*, 1858.
- 1800 House of Commons, portions preserved.
- 1800 (?) Cranburn lodge, Windsor forest; additions in the rear; A., 1823, 3rd ser., i, 63-4.
- 1800 Goodwood, Sussex, for duke of Richmond; greatly enlarged.
- 1800 London, East India house, Leadenhall street; but it was designed by R. Jupp.
- 1801-16 Belvoir castle, Leicestershire, for duke of Rutland; great alterations, and later by rev. sir J. Thornton; and after the fire of 26 Oct. 1816; N., 1819, ii; A., 1825, 3rd ser., v, 126; *ELLER, History of the Castle*, 8vo., 1841. *CIVIL ENGINEER, etc., Journal*, 1841, iv, 277-9. *ILL. LONDON NEWS*, 1843, iii, 377-8.
- 1802-11 Kew old house; some repairs, and nearly all taken down 1802. The new palace for king George III; nearly all covered in in 1811; not completed, taken down 1827-8; eight towers; cost £500,000, and £500 per ann. for repairs. *LYSONS, Environs*, Supp., 4to., 1811, p. 25. Said to have been all of cast iron, after his invention, patented 1808, except the floor-boards. 68.
- 1803 Westminster abbey; vaulting of central tower after fire of July 1803; with Bernasconi's composition. *NEALE, Westminster Abbey*, ii, 143.
- 1804 bef. Roehampton Grove, Surrey; villa for sir Joshua Vanneck, or H. W. Agar Ellis, viscount Chifden; N., 1826, 2nd ser., iii. *HASSELL, Views*, fol., 1813, then owned by W. Gosling.
- 1801 Ripon, Town hall, Yorkshire.
- 1803 No. 22, S. James's place, house for S. Rogers; cornices and chimney pieces by Flaxman.
- 1806 Great Yarmouth, Norfolk; the armoury or naval arsenal with stone wharf, cost about £14,500; broken up since, before 1829; *DRURY, Gt. Yarmouth*, 8vo., 1826; p. 129.
- 1808-13 Ashridge castle, Hertfordshire, for the earl of Bridgewater; (Gothic); N., 1829, 2nd ser., v. *PICTORIAL HISTORY OF ENGLAND*, sect. iv, 709. *TODD, History of the College of Bonhommes*, fol., 1823. *ILLUSTRATED LONDON NEWS*, 1851, xviii, 59. *BRITTON, Todington*, 4to., 1810, p. xvi, 14 and 18. Completed 1814-20 by sir J. Wyattville; and the morning-room, etc., by sir M. D. Wyatt, *B. J.*, 1860, xviii, 104-5. *BREWSTER, Edinb. Encey.*, 4to., 1830, pl. 191-2, p. 659.
- 1809-13 (22) Westminster abbey, restoration of Henry VII's chapel. Jer. Glanville, clerk of the works; commission 5 per cent. = £42,000. Thos. Gayfer, mason.
- 1809 Festivities at Frogmore when George III entered the 50th year of his reign; assisted by J. W. HORT of the Board of Works.
- 1810 before, Gunton hall, near Aylsham, Norfolk, for Edward Harbord, lord Suffolk, "the offices said to be superior to any in the kingdom," *NORFOLK TOUR*, 8vo., i, 164. N., 1820, iii.

1812 Elvaston hall, Derbyshire, for C. Stanhope, earl of Harrington, by Mr. Walker after Wyatt's death in 1813 (see BENJAMIN DEAN). N., 1818, i.

1813 Old palace yard. The courts altered.

1813 Chicksands, Bedfordshire, for sir J. Osborn, bart.; (1750 by I. Ware); alterations; N., 1829, 2nd ser., v. ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1866, p. 331.

Works attributed to James, not dated :—

Badminton, Gloucestershire, for the duke of Beaufort.

Alton Towers, Shropshire, for earl Shrewsbury. ADAMS, *Guide to the Peak*.

Ammerdown park, Somersetshire, for T. S. Jolliffe.

Ardbracon, near Navan, for bishop of Meath.

Bryanston, Dorsetshire, for H. W. B. Portman, esq., 112 ft. by 110 ft. W., pl. 83.

Buckingham house, S. James's; staircase, etc. PYNE, *Royal Residences*,

4to., 1819, ii, 7.

Cashibury, Hertfordshire, for earl of Essex, erected early XIX; rebuilt

greater part. BRITTON, *Cashibury*, fol., 1837, p. 27.

Chichester, the assembly room, 60 ft. by 38 ft. 6 ins. by 24 ft. high.

DALLAWAY, *Chichester*.

Delamere house, near Northwich, Cheshire, for father of George Wilbraham,

esq. T., iv, 112.

Devizes, Wiltshire; the Market Cross; NOTES AND QUERIES *Journal*,

3rd ser., x, 69.

Sophia Lodge, Clewer, for Wm. Dawson, esq., of Craven, Yorkshire; A.,

1823, 3rd ser., ii, 249-50.

Hurstable, Hampshire, for earl of Portsmouth, erected by Meadows from

designs by Wyatt.

Hanworth church, Middlesex (English Gothic).

Llanydgaï, for G. H. D. Pennant, new fronted.

Nacton, Suffolk, for P. B. Brooke, esq.

New Park, Wiltshire, for James Sutton, esq.; N., 1822, v.

Norris Castle, East Cowes, Isle of Wight, for lord Henry Seymour; ENGLE-

FIELD, *Isle of Wight*, 4to., 1816, p. 57. A., 1826, 3rd ser., viii, 1.

... A casino for ... Shaw, esq.

Powderham castle, Devonshire, for W. Courtenay, viscount Courtenay,

additions to north wing; N., 1818, i.

Ragley park, Alcester, Warwickshire, for P. C. I. S. Conway, marquis of

Hertford; 1740 by vi-count Conway; and altered by Wyatt; N., 1821, iv.

Sheffield place, Sussex, for lord Sheffield.

Sunning hill park, Berkshire, for G. H. Crutchley, esq., altered and new

disposition of apartments; N., 1818, i.

Sutbury hall, Staffordshire, for lord Vernon.

Thirkley, near Thirsk, Yorks., for sir T. Frankland, bart.; N., 1822, v.

Thornden hall, Essex, for lord Petre: of white brick; added or completed

the hall, scagliola columns; BRATLEY, *Beauties of England*, 8vo.,

1803, p. 488.

Westdean house, Sussex, for lord Selsey; A., 1827, 3rd ser., ix, 311.

Wycombe abbey, Buckinghamshire, for lord Carrington, nearly wholly

rebuilt.

Worstead hall, Norfolk, for sir Berney Brograve, bart.; N., 1820, iii.

On the death of sir W. Chambers (who from 1782 had £500 per ann. and £10 for stationery), Wyatt was appointed 16 March 1796 surveyor-general and comptroller of his majesty's Office of Works, with like salary, and held it for forty years; the title was dropped in 1815. In 1770 he was elected A.R.A.; 1785, R.A.; and P.R.A. for the year 1805. In 1806 he held the office of architect to the Board of Ordnance; *Fourth Report of Commission of Military Enquiry*, p. 288. In 1783-6 assisted his uncle SAMUEL at the Albion mills. Among his pupils were his sons Benjamin Dean, and Philip; John Westmacott, younger brother of sir R. Westmacott, R.A.; J. M. Gandy, *cir.* 1785-92; M. Gandy, and P. J. Gandy Deering, were 1805-8 in his office; John Foster, jun., of Liverpool; and 1791-2 "ingenious Dixon his clerk" (ANGELO, *Reminiscences*, 8vo., 1828, i, 96). He designed his own residence *cir.* 1786 in Queen Anne street east, later No. 1, Foley place, and now Langham street, of which the back looked into Foley house gardens, now Langham place; after his death it was sold to capt. Charles Wyatt, M.P., who erected the adjoining buildings in Langham place to the left (north?) of it; ACKERMANN, 1822, 2 Ser., xiii, 250; LEEDS, *London in XIX Century*, 4to., 1827-32, p. 94. At the Inst. of Brit. Architects is a bust of Wyatt by Rossi (*Report*, 1839); and three small pencil drawings of Fonthill abbey. He died 5th September 1813, aged 67 (not 70 as often stated), by the overturning of his carriage near Marlborough, and was buried in Westminster abbey. He left four sons and

a widow; and died poor. GENTLEMAN'S MAGAZINE, 1813, pt. ii, 296-7; 1817, pt. i, 184.

His restorations of the cathedrals were severely commented upon by Gough, Englefield, Carter, and other writers, in GENTLEMAN'S MAGAZINE, 1792-1810; while Dallaway and some others wrote in his favour. DALLAWAY, *Anecdotes*, 8vo., 1800, p. 33, 56, 70-4, 82, 115-9, 158. ACKERMANN, *University of Oxford*, 4to., 1814. ACKERMANN, *Repository of Arts*, etc., 1813, x, 221-2. HUNT, *Architettura Campestre*, 4to., 1827, xiii. INGRAM, *Memoirs of Oxford*, 4to., Oxford, 1837. ELMES, in CIVIL ENGINEER, etc., *Journal*, 1847, x, 300-2. ASHITEL, in ENCYCLOPEDIA BRITANNICA, 8th edit., 1860. WILLIS AND CLARK, *Arch. Hist.—Cambridge*, 8vo., Cambridge, 1886. W. P. 1. 2. 3. 14.

WYATT (BENJAMIN DEAN), eldest son, and pupil, of JAMES, born 1775 in London, educated at Westminster school; then at Christchurch, Oxford, until 1797; visited on the continent, and is said to have been private secretary to sir A. Wellesley in Ireland and India; and returned 1802. In 1811 he was residing at No. 22, Foley place, and published *Observations on the Principles of the Design for the Theatre now building in Drury Lane*, 8vo., 1811; 1812; which theatre he obtained greatly through the interest of Samuel Whitbread, after the fire of 24 Feb. 1809; it was opened 10 Oct. 1812; EUROPEAN MAGAZINE, etc., 8vo., for October 1812, p. 260-4. A model of a superior design was exhibited at his house; ACKERMANN, *Repository of Arts*, 1812, viii, 287, with plate; BUILDER *Journal*, 1855, xiii, 437, 470: (1822 new interior by S. Beazley, and 1831 side portico). Exhibited 1812 Elvaston hall, Derbyshire, for C. Stanhope, earl of Harrington (perhaps after the death of JAMES); and south entrance of the archway at Highgate Rise. After the death of his father in 1813 he was appointed architect to Westminster abbey, where 1814 he restored the rose window of the south transept, made the alterations after the coronation of George IV, 19 July 1821; and others perhaps up to 1827, when E. Blore was appointed; NEALE, *Westm. Abbey*, 4to., 1823, ii, 270-1. Clarence or York house, S. James's had been 1820 commenced by R. Smirke for the duke of York; 1825-6 he was superseded by Benjamin when the building was up to the ground level; (plan and view in TRENCH, *Thames Quay*, etc.); and 1841 when it was purchased by the Sutherland family, Smirke added the upper story and recommended B. Wyatt (then in the King's bench) to design the internal finishings of the chief apartments; 1843 sir C. Barry made considerable alterations to the interior. 1827 with his brother Philip, designed Crockford's clubhouse, Nos. 50-53, S. James's street (refaced, etc., in 1873, and 1877 new tenants). Wynyard, Durham, for the marquis of Londonderry; enlargement (said to be by P. W. Wyatt, in ROSE, *Northumberland*, 4to., ii, 103); Holderness, later Londonderry, house, Park lane, for the marquis of Londonderry, with SAMUEL; 1828 altered Apsley house, Piccadilly, for the duke of Wellington, with his brother PHILIP; 1827-8 designed the Oriental club, Hanover square, with Philip; 1831 a house in Carlton House terrace, for marquis of Tavistock. Apr. 1831-4 Apr. the memorial column to the duke of York, in Carlton gardens, S. James's; 123 ft. 6 ins. high, the statue 13 ft. 9 ins. more; cost £25,000; (J. Robertson, in LONDON, *Arch. Magazine*, 8vo., 1834, i, with plans, etc.)

Experiments as to fracture and crushing were made for him by Bramah and sons, on granite, marble, gritstone and slate, recorded in INSTITUTION OF CIVIL ENGINEERS, *Transactions*, 4to., 1836, i, 231-5, probably for the column. R. L. Rounieu 1830 was a pupil. He retired and died about 1850, or after 18 Sept. 1852, in Camden Town (?). His portrait by S. Drummond, A.R.A., was engraved by T. Blood, for the EUROPEAN MAG., 1812.

James's other sons were Matthew Cotes, artist, decorator, and sculptor, etc.; Charles, also in India, and designed the Government house at Calcutta; and PHILIP, who in 1814 was at No. 1, Foley place; assisted his elder brother BENJAMIN DEAN as stated; and designed Conishead priory, Lancashire, for T. R. Gale Braddyll; T., ii, p. 5. He made various plans, etc., for TRENCH, *The Thames Quay*, etc., 4to., 1827. He died in 1836. W. P.

WYATT (HENRY), 1806-9 with JAMES in Queen Anne street east, in December 1809 received a medal at the Society of Arts for the best drawing of the screen at the Admiralty. He designed the houses in Great George street at the corner of Delahay street. ... Cutler was a pupil.

WYATT (H... J...), 1811 at No. 1, Foley place; 1812 at No. 360, Oxford street; 1812 designed the new parochial chapel at Hammersmith; 1823 at No. 27, Gerrard street, designed a farmhouse at Barcombe, Sussex.

WYATT (EDWARD), carver of No. 360, Oxford street; repaired the cabinet work, picture frames, etc., at Windsor castle for many years. A tomb on south side of the chancel of Merton church, Surrey, where he had property; (information, January 1869). His brother William was in the Office of Works (1844), and resigned.

WYATT (JOHN), prepared the design for Southwark bridge, of cast iron, over the river Thames, carried out 1814-19 by Rennie and Weston. 68.

WYATT (G...), 1810-2 (in the Albany, with LEWIS WILLIAM), designed Routhall, Shropshire, for col. Lyster; Tarzell house, Northumberland, for P. J. Selby esq.; and a turnpike gate on Bath road, near Devizes. C. F. Porden was a pupil or clerk. He may be the same person who designed 1856 sixteen houses in Leicester square, Palace gardens, Bayswater.

Branch from William, brother, to Benjamin of Blackbrook.

WYATT (THOMAS HENRY), eldest son of Matthew Wyatt of Loughlin house, Roscommon, barrister, who 1818 left there for London, and was appointed magistrate for Lambeth. THOMAS was born 9 May 1807 at Loughlin; became a pupil of P. Hardwick, R.A.; was appointed 12 April 1832 district surveyor for S. John's Hackney and resigned about 1861; 1870-3 he was president of the Royal Inst. of Brit. Architects; and 1873 received the royal gold medal. David Brandon, F.S.A., was in partnership with him from 1838 to 17 March 1851. Among his pupils were his brother (sir) Matthew Digby Wyatt, his son Matthew (who 1888 printed *memoirs* of his father and uncle sir M. D. Wyatt); Edward Barry, R.A.; and S. Salter. He died 5 August 1880, aged 73, at No. 77, Great Russell street, and was buried at Weston Patrick, near Basingstoke, which he rebuilt partly at his own expense. In the *BUILDER Journal*, 1880, xxxix, 193, 516, is given a list of his numerous designs. *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1879-80, p. 230. His second son Thomas Henry has obligingly added many dates to all these articles of the Wyatts, with other details, from family papers.

WYATT (sir MATTHEW DIGBY), youngest son of Matthew of Loughlin, and brother and pupil of THOMAS HENRY, born 28 July 1820 at Rowde near Devizes. He travelled 1844-6 on the continent, and on his return published *The Geometric Mosaics of the Middle Ages*, fol., 1848; assisted in the plan and details of the Great Exhibition of 1851; and was secretary to the executive committee. Between 1852-4 he arranged several fine art departments at the Crystal palace. In 1855 he was appointed surveyor to the East India Company, and designed various buildings for them, and the interior of the India offices at Whitehall on their erection by sir G. G. Scott. He gave several *Lectures* at the Society of Arts; and published works on *Metal Work*, *Ivory Carvings*, *Art Treasures*, *Illuminating*, etc. From May 1855-59 he held the office of honorary secretary to the Roy. Inst. of Brit. Architects, read several papers there, and 1866 received the royal gold medal; also received prince Albert's private medal; was a chevalier of the legion of honour; also Disney professor and honorary M.A. of Cambridge. On account of failing health, in May 1874 he retired into the country; died 21 May 1877, and was buried in the churchyard at Usk, Monmouthshire. *BUILDER Journal*, xxxv, 541, 545, 550; xxxvi, 49, 391.

WYATT (JOHN DRAYTON), born 11 Dec. 1820, at Nailsworth, Gloucestershire, son of Dr. Peter Wyatt, was 1837-40 a pupil

of H. W. Inwood, and a student at the royal academy. In May 1841 he was engaged with messrs. Scott and Moffatt, and 1846 remained with Scott as one of his principal assistants. He was appointed diocesan architect of Bath and Wells, and in 1867 relinquished his office work. He restored S. John's church, Wolverhampton; restored and rearranged S. Peter's church, Cornhill; the parish church at Winchcomb, Gloucestershire; designed there the "Dent's schools"; and was consulting architect to the archdeaconry of Sudbury, Suffolk; designed Christ church, Gretton, for Mrs. Dent of Sudeley castle, and other works thereabouts; and especially the restoration of Sudeley castle, under sir G. G. Scott, wherein is a tablet in the chapel recording the works done by them from 1863-87. For sir G. G. Scott he made the splendid drawings for the reredos and pulpit at Ely cathedral; 1851-3 he was president of the Architectural Association. He was a quick and talented draughtsman. He died 22 Feb. 1891, aged 69, and was buried in Abney park cemetery, Stoke Newington. *ROYAL INSTITUTE OF BRITISH ARCHITECTS Journal*, 23 April 1891, p. 272. *BUILDER Journal*, 1891, lx, 313.

WYATT'S CEMENT. The same as Parker's (1796) afterwards Roman cement. The manufacture was continued by Charles Wyatt, who was succeeded by his son James during some years, when the business became unsatisfactory and fell into the hands of a distant relative, Walter Henry Wyatt. When he died the old firm ceased. In 1837 the firm was "J. & C. Wyatt & Co., Walcot cottage, Lambeth". In 1841 it was "Wyatt, Parker & Co.", who published *Catalogue of Statues, Furnitures, Vases, etc.*, 4to., 1841. It is stated that James Wyatt, R.A., *cir.* 1786 used it on his own house in Queen Anne street east; and after 1 January 1779 he used HIGGINS'S CEMENT in Conduit street, and elsewhere, as stated in that article.

WYATT'S PATENT SLATING. The invention of James Wyatt, R.A. See SLATING; PATENT. 1.

WYATT WINDOW. Similar to the Palladian and VENETIAN WINDOW, but not having a semi-circular head. A term in use in Dublin 1819-65. STITT, *Practical Architecture*, 8vo., 1819, p. 37.

WYATVILLE (sir JEFFERY); see WYATT (JEFFERY).

WYBORG. See WIBORG, in Finland.

WYCH HAZEL. See OPLE TREE; and HAZEL. There is also a wych elm.

WYCH'S STUCCO. Take 4 or 5 bushels of plaster such as is burnt for floors about Nottingham, or tarras, plaster, or calcined gypsum, and beat it into a fine powder; sift it into a trough and mix with it one bushel of pure coal ashes, well calcined; pour water on it gradually until the whole mass has the consistency of plaster; SREATON, *Builders' Pocket Manual*, 12mo., 1847, p. 123, 2nd edit.

WYDRAUGHT. A term used in the repairing covenants of some leases of houses. "A wide draught, chief drain, main sewer"; also as a freeboard or joint space between houses for an eaves drip and drain. *Cir.* 1516, "a house for the comyn wyddrowght of the said college"; WILLIS AND CLARK, *Arch. Hist.—Cambridge*, 4to., 1886, ii, 245; iii, 623. *BUILDER Journal*, 1876, xxx, 536. 1736, "a water course, sink, or common sewer to carry off the sullage or filth of a house, etc." 4.

WYENHOVEN (PIERRE VAN), 1533-9, designed the attached chapelle du Sacrement, in the church of SS. Michel and Gudule, at Bruxelles.

WYKEHAM (WILLIAM OF), born between 7 July and 27 Sept. 1324; studied grammar, French, geometry, logic, and arithmetic; about 1347 he was recommended to king Edward III who 10 May 1356 gave him the office of "clericus omnium operationum nostrarum" in the manors of Henle, Yeshampstede, etc., with a fee of 1s. per day when at the works, 2s. per day when travelling; his clerk 6d. per day (*Harl. MS.* 6960, p. 29a). 1356 Oct. 30, appointed by the king "supervisorem operationum nostrarum in castro nostro di Wyndesor, Easthampstede et Henlee, etc.", empowered to impress artificers,

etc.; with same fees (succeeded by W. de Mulso). 1357 Nov. 14, to have 1s. per day more until he should be provided with ecclesiastical preferment. 1359 Apr. 28, again appointed "supervisor" at Windsor castle; *LELAND, Collectanea*, v, 378. 1359 July 10 appointed "capitalem custodem et supervisorum castrorum regis de W.", and other places, in which year king Edward "began the new edifying of Wyndesore", etc. It was perhaps at this time that he sold the houses, noticed in *TURNER AND PARKER, Dom. Arch.*, 8vo., 1853, ii, 9. 1360-2 appointed dean of S. Martin's-le-Grand, and rebuilt in a very handsome manner the cloister of the chapter-house and the body of the church. 1361 March 10, "fuit sup. oper. regis" (again 1361 succeeded by W. de Mulso as clerk of the works there and elsewhere, and in 1362 as chief warden and supervisor). 1361-7 Queenborough castle is attributed to him (also to John GIBSON, marmorarius; R. de Blore, clerk of works; and H. de YEVELE), 1367 Sept. 17, appointed bishop of Winchester. 1373 began the formation of a school at Oxford; and 1379-80 March 5, laid the first stone there of New college; opened 1386, April 14. 1387 March 26, commenced S. Mary's college at Winchester, opened March 28, 1393. 1394 commenced west front, with alteration of nave and aisles of his cathedral.

It has been considered that he had some hand in the building of Edington church, Hampshire; *B. J.*, 1857, iii, 577. Wykeham is also stated to have rebuilt the palace at Bishops Waltham, Hampshire, now a mere ruin; did works at King's Sutton; 1359 Leeds castle, Kent, as supervisor for Edward III; and the chancel of Adderbury church, Oxfordshire (belonging to New college) "the undoubted work of Wykeham (INGRAM, *Memorials of New College*; and *Subarcuation*, in *B. J.*, 1845, iii, 465). The traditional words "Hoc fecit Wickam", carved on the Winchester tower (?) at Windsor castle, was "on wall of round tower in 1680-84"; *DINGLEY, History from Marble*, by CAMDEN SOCIETY, 4to., 1807, pl. 94 (111); *Arch. PARKER, Antiq. Brit. Eccles.*, fol., 1572; it was perpetuated by sir J. Wyatville on Winchester tower. Wykeham's portrait is in stained glass (WEALE, *Quarterly Papers on Architecture*, 4to., 1844-5); that of his effigy is not considered of much merit, according to WALPOLE, *Anecdotes*, 8vo., 1862, i, 23; and 21 Dec. 1761 the earl of Bute presented to Winchester college a bronze statue of Wykeham, "supposed XIV cent." In 1403 July 4 he made his will, leaving the works at the cathedral to W. WYNFORD under the supervision of S. Membury, and J. Wayte sup. and controller; and died 27 September 1404, aged 79, at Bishops Waltham; he was buried in his chantry chapel in the cathedral.

HAYDON, *Eulogium* (Hist. sive Temp.) *Chronicon. Malmesb.*, 8vo., London, 1863. MARTYN, *Life*, written in 1597, published 1690. CHANDLER, *Life*, cir. 1470, 12mo., 1775; 1842. LOWTH, *Life*, 8vo., Oxford, 1758; 1777. UVEDALE, *Examination of Lowth's Objections to Leland's Account of the Parentage and Education of W. of W.*, 8vo., 1801. COCKERELL, *His Colleges, etc.*, in *BRITISH ARCHAEOLOGICAL ASSOCIATION*, Winchester volume, 8vo., 1846; and *B. J.*, iv, 448, 455. WALCOTT, *W. of W. and his Colleges*, 8vo., 1852. WALCOTT, *Story of a Great and Good Man*, read at Architectural Exhibition, 29 May 1860; *B. J.*, xviii, 345, 377. PAPWORTH, *Superintendents of English Buildings in the Middle Ages*, 23 Jan. 1860, and 2 Dec. 1861; reprinted 1887, giving references; also *Journal*, 1887, p. 385. TIGHE AND DAVIS, *Windsor Castle*, 8vo., 1858. ASHTON AND POYNTER, *Windsor Castle*, fol., 1841; and review in *CIVIL ENGINEER*, etc., *Journal*, iv, 278-80. MOBERLY, *Life*, 8vo., Winchester, 1887.

DALLAWAY, *Observations*, 8vo., 1806, p. 116; and *Discourses*, 8vo., 1833, p. 69-72; 415, 425-50. DUGDALE, *Monasticon*, fol., 1849, vi, pt. 3, note p. 1323. NICHOLS, *Collect. Topog.*, etc., 8vo., 1836, iii, 178, family. *ECCLESIOLOGIST Journal*, 1836, p. 222. UNIVERSAL MAGAZINE, 1766, xxxviii, 337-45. PYNE, *Colleges of Oxford*, 4to., 1814, i, 146-53.

WYLLENER (JEAN), 1440 January, with other architects and workmen engaged to uphold the four pillars of the transept.

ARCHT. PUB. SOC.

septs of the church of S. Ouen at Rouen; *LANCE, Dict. des Arch. Franç.*, 8vo., Paris, 1872.

WYLLSON (JAMES), born 1811 at Glasgow, was apprenticed for five years to ... Weir, and remained with him for four years longer. In 1836 he removed to Norwich assisting J. Brown; and on coming to London he became senior clerk to S. Smirke, R.A., till 1843. He 1842 was the originator and first secretary of the "Association of Architectural Draughtsmen". He returned to Glasgow where he designed an extensive range of model dwellings for the labouring classes, and wrote *Remarks on Workmen's Houses in Town Districts*, 8vo., Glasgow, 1848; designed the Prince's theatre (since cleared away), S. Luke's Free church, to the pulpit of which he 1855 applied his parabolic sound reflector (SOUND BOARD); and 1848 obtained the first premium for laying out the lands of Gilmour hill for building purposes. In 1850 he left for London, and was engaged by sir C. Barry; elected surveyor to the National freehold land society; about 1860 to the Conservative land society (succeeded by John Ashdown), and the United Land Company limited. He was greatly interested in the study of mathematical problems. To this *Dictionary* he contributed many articles and revised several proofs. Among the subjects which he sent to the *BUILDER Journal* in its early days are: 1844, ii, *Elementary Essay on Mortar and Cements*; 1845, iii, *Timber and its Uses; Decay in Timber, Cause and Cure; Dry-rot and Worms in Timber; York Minster, its Fires and Restorations*; and 1850, viii, *Gropings in Practical Acoustics*. He edited "Adecock's Engineer's Pocket-book"; was author of *The Practical Architect*, Glasgow, 1836; of *The Mechanical Inventor's Guide*, 1859; and contributed to the "Glasgow Citizen" ten articles on items connected with architecture and the allied arts in the Great Exhibition of 1851. He died 6 January 1870, and was buried in the Brompton cemetery. *BUILDER Journal*, xxviii, 41. His son Oswald C. Wyllson follows the profession. *BUILDING NEWS Journal*, xxiii, 23. *ARCHITECT Journal*, iii, 23.

WYMBYLL; mortars. An auger for mortising, 1407-8; SURTEES SOCIETY, *York Fabric Roll*, 8vo., Durham, 1859, p. 207, 348, 359; and *Finchale Priory*, 8vo., 1837, index. WOMBLE.

WYND. Term in the north of England and in Scotland (S. ANDREWS) for a lane broader than a close, so as to allow a cart to pass. Generally, a long narrow and irregular or winding street.

WYNELL. An alley.

WYNESBACH STONE. A quarry in Dorsetshire, from whence and also from Abbotsbury, and from Bere in Devonshire, R. de Esshyng was appointed to procure workmen and to raise stone for the works at the palace at Westminster, 24 Edward III, 1350-51; BRAYLEY AND BRITTON, *Palace*, 8vo., 1836, p. 245.

WYNFORD (WILLIAM), Wynneford, Winferd, Wynfor, Winford, mason. He is supposed to have been employed by bishop W. de Wykeham at all his works (LOWTH, p. 195), and to have been his architect. He had given to him by king Edward III certain lands and houses at Windsor, Dyrdworth or Didworth, Clewer and Bray, which had been given to the king, cir. 42 year (1368-9) by sir John Brocas; TIGHE AND DAVIS, *Windsor Castle*, 8vo., 1858, i, 186. 22 April 1370, W. de Wynneford, plasterer (?cementarius), was sent to various parts to retain divers plasterers (?) to be sent over in the retinue of the Lord the King beyond sea, with wages for 25, at 6d. per day each, by command of the Chancellor, etc. (i.e., W. de Wykeham); DEVON, *Brantingham Roll*, 4to., 1835, p. 3. Cir. 1379, perhaps employed at New college, Oxford, by W. de Wykeham. 1387-93 engaged at S. Mary's college, Winchester, where his portrait inscribed "Willielmus Wynfor lathomus", in the glass of the east window of chapel of the college, is figured by WINSTON, in *BRIT. ARCH. ASSOCIATION*, Winchester volume, 1846. 1394-1404 and later, at the cathedral, "The disposition and ordination of the works be made by magister W. Wynneford and others sufficient, discreet and approved persons in the art, as

may be deputed by my executors"; in will July 4, 1403, of W. de Wykeham; LOWTH, *Life of Wykeham*, 8vo. edit., 1758, app. xxxv. The date of his death is not known—but after 1404. PAPWORTH, *Superintendents, etc.*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1859-60 and 1860-61; and reprint in *Transactions*, New Series, iii, 1887, p. 189, 207. WYKEHAM. WALPOLE, *Anecdotes*, edit. 1826; and 1862, p. 125.

WYNNE (captain WILLIAM). See WINDE (W.).

WYNSCOTT. An old Scotch way of writing WAINSCOT.

WYNTON (WALTER DE), 1296-7, clericus operationum at

Beaumaris castle, which was begun to be built in the year before; HARTSHORNE, in *ARCHÆOLOGICAL Journal*, 1850, vii.

WYSP. A quantity of glass; 1469-70, "pro j les wysp vitri rubii 16d.", at York. 1471 "paid to Thomas Nelson of York, for 60 wysps of glass, at 10d. each; one wysp of ruby glass 16d.", BROWNE, *York Cathedral*, 4to., 1838-47, p. 251. GLAZIER.

WYVERN. See GRIFFIN.

WYWERS. Pieces of sawn timber; 1532 at Durham; SURTEES SOCIETY, *Finchale Priory*, 8vo., 1837, p. 445.

THE DICTIONARY OF ARCHITECTURE.

XANT

XAINTES, Xaintes, and Saintes (ISENBERT OF); see ISENBERT.
XAMETE or Jamete; also a sculptor; 1537-9 worked at Toledo; and 1546-50 carved the magnificent portal of the corinthian order, in Arcos stone, to the cloister of the monastery of the cathedral at Cuenca. BERRUGUETE. 65. 66. 68.

XANTEN, Santen, or Sancten. A town near Wesel, in the government of the same name in Rhenish Prussia, and situated near the left bank of the river Rhine. The country around abounds in Roman antiquities. Near it stood the castle of the Nibelungen. The fine collegiate church, dedicated to S. Victor, is built of trass or tufo; it has five aisles and chapels to the apse; no transepts. The west front *cir.* 1128, has two Romanesque towers on piers opening into the aisles. 1263 chancel commenced. The following is a list of the *magister fabricæ* or *baumeisters*. 1356-60 M. Jacob von Mainz, who built the sacristy, left, returned 1361-74, and 1368 did the eastern portion of north aisle, and restoration of the towers, etc.; his brother Heinrich 1360-61 acted for him. 1374 *cir.* meister Wilhelm. 1375-80 m. Konrad (? of Cleves) directed the roof and vaulting to the south tower. 1400 *cir.* the rood loft. 1408-37 m. Gisbert (? von Cranenburg); 1417 beginning of the vaulting; and 1437 buttresses and arches. *Cir.* 1455 m. Theodoric Moer, called *archilapicida*; and 1470-74 Heinrich Blankenbyl of Wesel, nothing done. 1483-7 Gerhard von Lobmar from Cologne, he with Heinrich consulted Johannis *domwerkmester* of Cologne, and the *steinmetz* m. Adam of Cologne, and often sent for meister Wilhelm Barkenwerd of Utrecht 1483-90, about the building of the middle aisle; of which part 1487 its windows were finished. (1486-1522 the whole building restored?) 1492-1522 m. Johannes von Langenberg of Cologne; 1492 the building of the south aisle, 1500 its vaulting, 1508 the buttresses, 1519 the great window between the towers, 1525 completion of the north tower. 1528 *cir.* m. Gerwin from Wesel worked at the sacristy and chapter-house; continued 1534 by Heinrich Maess who completed them 1550 with the transepts. The stations are carved on the exterior. The chapel of S. Michael on the south side is the oldest building in the town. SCHOLTEN, *Auszüge aus den Baurechnungen*, 8vo., Berlin, 1852-3. FIORILLO, *Gesch. der zeichnenden Künste in Deuts.* EGERS, in "Deutsches Kunstblatt", gives a list of the baumeisters 1263-1555. KING, *Medieval Arch. and Art*, fol., 1858-68, iii, gives elevation and details of two large brass candlesticks. BUILDER *Journal*, 1890, lviii, 249, 322, 358, gives views of the outside of the gate, and from the cloisters; interior of the choir; and view of the altars in the south aisle. *On Cleves*, by BREWER, in ROY. INST. OF BRIT. ARCHTS., *Transactions*, and *Journal*, May 1891. 28. 50. 92. 96.

ARCHITECTURAL PUBLICATION SOCIETY.

XENO

XANTHUS. An ancient city near the village of Koonik, in Lycia, Asia Minor; situated on the river Etchenchay. There are remains of Cyclopean walls, Phœnician or Etruscan inscriptions, fragments of temples, tombs, triumphal arches, and a theatre; these are not earlier than the Persian conquest of Cyrus and Harpagus. LION. HARPY. A large collection of the remains was brought to the British museum in 1842-3; many were rearranged in 1891; BUILDER *Journal*, lx, 24. TEXIER, *Asie Mineure*, fol., Paris, 1839-49. FELLOWS, *Journal*, 4to., 1839; *Discoveries*, 1841; and *Xanthus Monument*, fol., 1843. LLOYD, *Xanthian Marbles; the Harpy Monuments*, 8vo., 1844. R. HAWKINS, *Sculpture and Arch. Fragments brought from Xanthus, with a restoration*, read at ROY. INST. OF BRIT. ARCHTS., 10 Feby. 1845, printed in CIVIL ENGINEER, ETC., *Journal*, viii, 89-99. *Xanthian Marbles* in B. J., 1845, iii, 301. FELLOWS, *Account*, 8vo., 1848; *Travels*, 2nd edit., 8vo., 1852. PENNY CYCLOPEDIA, 1846, Supp., ii, 713. FORBES AND SPRATT, *Lycia, etc.*, 8vo., 1847. *Ionian Monument*, as restored by E. FALKNER in his MUSEUM OF CLASSICAL ANTIQUITIES, 8vo., 1860, i, 256-84. FERGUSSON, *History of Architecture*, 8vo., 1865, i, 204.

14 and Supp. 23.

XEA (JUAN DE), of Andalucia, 1557 went to Seville to examine with other architects the works at the cathedral. 66.

XENIA. The Greek term for the paintings representing landscapes, vases with fruits, fishes, etc.; VITRUVIUS.

XENOCLES of Cholargus, was employed under Ictinus at the building of the TELESTERION, or temple to Demeter (Ceres) at ELEUSIS; PLUTARCH, *Life of Pericles*, 13, states that Xenocles made the opening in the tympanum to light the cella, as the temple was not hypæthral; over the galleries and upper order of columns of METAGENES; or "roofed, or domed, or arched, or completed in some way, the top; each investigator arriving at different results, according to his interpretation of the words τὸ ὕψαιον ἐκὸρῆψαι.

Perhaps this cell was not Greek at all but only a rebuilding by the Romans.... Mr. Penrose describes the columns discovered as being late Roman.... the original form of this temple is still as much a mystery" as hitherto; LEWIS, *Notes made during Tours in 1881 and 1884*, read at ROY. INST. OF BRIT. ARCHTS., *Transactions*, 1886-7, p. 85-90, and *Journal*, p. 169-70; and other references s. v. Telesterion. SOCIETY OF DILETTANTI, *Unedited Antiquities*, fol., 1817, p. 31. 59.

XENODOCHIU (Gr. ξένος, guest, and δέχομαι, to receive). The name given by the Greeks to a building for the reception of strangers; such as that at Lubeck; the spital Sta. Catherine and spital de S. Anastase dit de S. Gervais.

Also, a room in a monastery for the reception and entertainment of strangers, pilgrims, and relief of paupers. Xenodochus was the title of the officer in charge. LINGARD, *History of the Anglo-Saxon Church*, p. 145; FOSBROKE, *Brit. Mon.*, p. 36.

XENONES. In some large houses of the Ancients, rooms on the ground-floor were set apart for the reception of guests; VITRUVIUS, *l. c.* POLLUX, iv, 125. EURIPIDES, *Alcest.*, 564. 19. 78.

XERO. A siccative (Fr. *siccatif*) or PATENT DRIER; DRIER.

XEROKAMPO, situated about three hours' ride to the south of Sparta, in Laconia. An arch built over a tributary of the Eurotas; this bridge was first discovered by Ross, and described by MURE, *Tour in Greece*, 8vo., Edinb., 1842, ii, 247, who supposes it to belong to the same period as the monuments of Mycenæ. LEAKE, *Peloponnesiaca*, 8vo., 1846, p. 116. ARCH. 78.

XIMENES, of Naples, architect to Leopold I, grand duke of Tuscany, made a canal from the river Ombrone to the lake of Castiglione, to keep the latter at the same level; finished 1830; WILSON, *On State of the Arts in Italy*, in CIVIL ENGINEER, ETC., *Journal*, 1841, iv, 38.

XIMON (meister), 1406-52 at Seville cathedral. See JIMON.

XIMON PEREZ. In 1522 submitted to the chapter of Seville many plans and designs for the sacristies and chalices, etc. 66. 116.

XOCHICALÇO, an ancient place in Mexico. The chief ruins are on a hill about 300 feet above the plateau, and around the hill, a deep and broad ditch lined with cemented stone, is about three miles in length. Above this, the slope has a series of four or five high terraces supported by walls of large rough masses of *tepete*, a porous volcanic stone. On the top, in the centre of a broad esplanade, are the ruins of a *teocalli*, the most remarkable to the north of Yucatan and Guatemala. It was perhaps a five-storied temple of hewn stone about 50 feet in height, of which only the lower story remains, 64 ft. by 58 ft., of huge dressed granite blocks cemented together; the frieze enriched with bas-relief figures; further details are given in "The Times" newspaper of 20 November 1874. NEBEL, *Voy. Pitt. du Mexique*, fol., Paris, 1836.

X. P. I. The initials of the Greek name of Jesus Christ. A standard or monogram adopted by Constantine, and represented in paintings and mosaics by the Greek Christians. ASSOCIATED SOCIETIES, *Reports and Papers*, 8vo., 1869, x, 78.

XULBE (PASCASIO DE) of Tortosa. See JULBE (P. DE).

XULON. The cross. Sonorous wood used as a substitute for a bell.

XYLOCOLLA. The Greek term for GLUE.

XYLOGRAPHY. The art of engraving on wood. A patent process by W. Dean, for taking impressions from the grain of wood and transferring these impressions on to other surfaces; described at SOCIETY OF ARTS, 27 January 1869, and printed in its *Journal*; also BUILDER *Journal*, xxvii, 81; and BUILDING NEWS *Journal*, xvi, 89, 113, 145, 165.

XYLOIDINE. The name given to paper which has been immersed for a moment in strong nitric acid and then washed in distilled water, when it assumes the feel and toughness of parchment, and is so combustible as to serve for tinder. 14.

XYLONITE. The base of this material, called "Parkesine"

by its inventor, Alexander Parkes of Birmingham, and first exhibited at the Exhibition of 1862, is fibrous vegetable matter, such as cotton waste, flax waste, and old rags. These are dissolved by acids and then yield pyroxyline, the highly dangerous nature of which is neutralised by various chemical ingredients. In a liquid form, Parkesine is available for waterproofing fabrics; in a plastic state, it is useful in making tubes, etc., and for insulating telegraph wires; a hard state is produced by the admixture of oils; or of gums, etc., when it is required for other special applications. It will take any desired colour, or any degree of hardness, and is susceptible of high polish; but at 340° Fahr. it is consumable, without bursting however into flame; it gives off a dense smoke, and its residue is a dark-coloured ash. BUILDING NEWS *Journal*, 1866, xiii, 706-7; ART JOURNAL, July 1866; BUILDER *Journal*, 1866, xxiv, 527. This invention has since been renamed XYLONITE, from Gr. *ξύλον*, wood, and is manufactured from woody fibres, which are converted by the action of a mixture of sulphuric and nitric acids into a substance called XYLOIDINE (AIDE MÉMOIRE, 8vo., 1845-52, ii, 207), and thence by machinery and solvents into Xylonite, for the manufacture of numerous articles; ENGLISH MECHANIC *Journal*, of 1871; BUILDING NEWS *Journal*, 1871, xx, 55.

"Xylonite-stucco", paper stucco, is the name of an invention for the decoration of rooms in lieu of ordinary plaster, is light, elegant, of correct and excellent design, can be affixed by common screws or thin wire nails by any carpenter or painter. The cornices, friezes, and moldings are supplied in 3 meter or about 10 ft. lengths by R. Schreiber and Co., of Raschau in Saxony, and was put forward June 1891 in London.

XYLOPHAGI. See WORM. SELLIUS, *Hist. Nat. Teredinis seu Xylophagi Marini, Tubulo-conchoidis Speciatum Belgici*, 4to., Trèves, 1733.

XYLOTECHNIGRAPHY. The patented process for the decoration of the natural wood by staining. Specimens of cabinet work decorated by this process were seen at Trollope and Sons' ware-rooms, at the International Exhibition, May 31, 1871. BUILDER *Journal*, 1870, xxviii, 640; and BUILDING NEWS *Journal*, 1871, xx, 445, 449.

XYSTUM (probably the Greek *ξύστῶν* or *περίδρομίδες*); Lat. AMBULATIO. There has also been a belief that the neuter noun was intended to comprise the whole area, or AMBULACRUM. A walk, path, or alley; VITRUVIUS, v, 11; vi, 10.

XYSTUS (probably the Greek *ξύστῶς* or *περίδρομίδης*); Lat. AMBULATIO, a long walk, path, or alley; a sort of colonnade, corridor, or verandah, VITRUVIUS, v, 11. A spacious portico in which the athlete exercised themselves during winter. PALESTRA. The Roman Xystos was an hypæthral or uncovered walk, shaded by trees; VITRUVIUS, iv, c. 10. SMITH, *Dictionary*, s. v. Balnea, p. 195a. 78.

The peristyle of a house was larger than the atrium, and when decorated with shrubs and flowers was called xystus; it should be greater in extent transversely than in length, and the spaces between the columns should not exceed four, nor fall short of three, diameters of the columns. *Pompeii*, 8vo., 1832, ii, 11, 17.

THE DICTIONARY OF ARCHITECTURE.

YARD

YACHT or **YATCH CLUB HOUSE**. **BOAT HOUSE**. A vessel of state for the monarch or prince; or those of a smaller kind employed by commissioners, or used as pleasure boats by private gentlemen; where a club of yachtmen is formed at a sea port, a house is devoted to it, as at Kingstown, near Dublin, by G. Papworth, R.H.A., two views in *ILLUSTRATED LONDON NEWS*, 1846, viii, 333. Royal National Lifeboat Institution, *BUILDER Journal*, 1883, xlv, 125, 363, gives several illustrations of the houses from designs by the late C. H. Cooke. 2.

YALOBATZ. The modern name for **ANTIOCHEIA PISIDIE**, between Phrygia and Pisidia.

YANINA. See **JOANNINA**, in European Turkey.

YARD. An uncovered piece of land, very often enclosed by walls, or buildings; it is used for various special purposes, as follows:—**BACK YARD** of a house. **BUILDER'S YARD**. **TIMBER YARD**. **BRICK YARD**, see **BRICK** (p. 138). **WOOD YARD**.

YARD, **yard** and **yerde**. A spar or rafter of a roof. "The *yardys* called sparses of the hall *ryalle* conteyneth yn length about 45 fete of hole pces"; W. of **WYRCESTER**, *Itinerary*, by S. Simeonis, 8vo., Cambridge, 1778, p. 260.

YARD. An English measure of length. Its variations at several periods may have affected the proportions of the mediæval edifices, and in regard of the **PERCH** which was also used. **ELL**. **ULNA**. **MEASURE**. **PROPORTION**. Besides the standard set up in the wall near to the entrance to Greenwich Observatory, as mentioned *s. v.* **Measure**, others are set up in Trafalgar square at the base of the north high wall; and other six lengths placed in 1878 in Guildhall near the gallery.

959-75 King Edgar ordered one weight and measure for all England after the standard of London and Winchester.

1100-35 King Henry I ordered the *ulna* to be the exact length of his own arm. **ELL**.

1197 King Richard I ordered one measure throughout the land.

1272-1307 King Edward I's arm was taken as the yard.

xiv cent. *Ulna* of 3 feet: and of 5 feet; 5 ells a perch.

1305, 33 Edward I, "De terris mensuranda"; x perches by xvi perches = an acre.

The yard and handful, or 40 inch ell, abolished 1439.

The yard and inch, or 37 inch ell (cloth measure), abolished after 1553; known later as the Scotch ell = 37.06, or 3 × 12.353.

Cloth ell of 45 ins. used until 1600.

The yard of Henry VII = 35.963 ins.

1445 A silver yard measure of this date is still retained by the Merchant Taylors' company; used by them at Bartholomew Fair.

1515 Louth steeple "was in length from the ground to the highest stone of the broach by the king's yard 18 score feet, and great measure showed by master mason and his brethren"; *ARCHÆOLOGIA*, 1792, x, 86.

ARCHITECTURAL PUBLICATION SOCIETY.

YARD

1547 A tailor's yard (1434, *virga cissoria*); and "tailors yerdes", equal to 45 inches, used in measuring land; WILLIS AND CLARK, *Arch. Hist. — of Cambridge*, 4to, Camb., 1886, ii, 427, 678, 727.

1758 Brass measure in possession of hall keeper at Guildhall.

1760 This Parliamentary standard is believed to be about $\frac{1}{140}$ of an inch longer than the old standard of the country.

36 square yards = a rood, in mason, brick, and slater work.

A square acre will be comprised in 69.57 yards nearly, each side.

In 1 yard square, *i. e.* a yard each way, 4 soldiers can be drawn up; 6 persons standing; and 9 persons closely packed. An acre = 29,040 persons.

A Persian yard = 44 inches Engl. PORTER, *Travels*, i, 412.

The *ongyia* or Egyptian yard = 100 part of the stadium, and measured 6.058 ft. French. SILBERMANN, 1859; by JOMARD 6.058: also 5.345 ft.

A mètre is equal to 3.2808992 English feet. A square mètre = 1.196033 square yards English. A cubic Toise = 9.68428 cubic yards.

JAMES, *Comparisons of the Standards of Length of England, France, etc.*, 4to., 1866. *ENCYCLOPEDIA BRITANNICA*, *s. v.* **Weights and Measures**, 9th edit., 1888; CASSELL'S *Popular Educator*, 1852-3; COLENSO, *Arithmetic*, 8vo., 1875, p. 138-9.

YARD AND A HALF. See **GOAD**.

YARD-LAND. That is land sufficient for a plough of oxen and a yard to winter them. Ancient copyhold tenements into which manors were usually divided each being occupied by one tenant and enjoying equal stinted rights of common. **VIRGATE** or **VERGE**. A current custom of Wiltshire; SEEBOHM, *English Village Community*, 8vo., 1883, p. 117-25. Thirty to forty acres, *idem*, p. 27. In some places 15, 20, 24, 30 and 40 acres; *NOTES AND QUERIES*, 1862, 3 Ser., ii, 465. A "ferling" was the fourth part of a yard-land, *KELHAM, Domesday Book*, 8vo., 1788, p. 210; *i. e.*, thirty-two acres according to COKE, but ten acres according to SPELMAN. *DUGDALE, Warwick*, fol., 1656, p. 65, says "four yard-lands make one HIDE".

YARD OF BALLAST, or gravel; or load was 1750 equal to 18 heaped bushels; and of sand 24 heaped bushels. *BUILDER Journal*, 1878, xxxvi, 1314, 1370: xxxvii, 56. 4.

YARD OF LAND. A quarter of an acre, so called because in ancient common field lands where the furlongs were 40 poles long, the quarter of an acre was a land-yard or pole at each end.

YARD OF LIME; or load. In 1750 it was equal to 30 or 32 bushels; a waggon load of 100 bushels only held 70 bushels. *BUILDER Journal*, 1876, xxxvi, 1262: and xxxvii, 56. 4.

YARD OF MORTAR. It consists of 1 yard of sand, struck = 22 bushels; 9 bushels of stone lime = 9 bushels; and 59½ gallons of water, making 31 bushels altogether.

YARD OF STONE. See **PERCH**.

YASSI. See JASSI, in Moldavia.

YAT. The heraldic name for a gate; it is also used in Gloucestershire.

YATAM. A machine used in Hindostan for raising water. BUCHANAN, *Mysore*, 4to., 1807, i, 295, 329; ii, 461; and iii, 183.

YATES (WILLIAM), 1555 built Tixal house, Staffordshire (Elizabethan), for sir Edward Aston (died 1589); it was rebuilt 1780. In 1580 the large and fine gateway, of three orders, for sir Walter Aston; now dilapidated. BRAYLEY, *Beauties of England*, 8vo., 1813, p. 907; *BUILDING NEWS Journal*, 1886, 1, 416.

YBL (NICOLAS), of Hungary, designed some of the finest buildings in Buda-Pest. The Leopoldstadt church 1855 was commenced by Hild, on whose death it was entrusted to Ybl who carried out the drum for the cupola; cracks ensued and ultimately it fell in; an account is given by LANGE, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1867-8, p. 239-40. 1866 the temporary *landhaus*. The parliament houses are given in *ALLGEMEINE BAUZEITUNG*, 1868-9, pl. 20-3. He died on or about January 23, 1891, aged 77.

YBSAMBUL, Ebsambul, Ipsambul; see ABOO-SIMBEL, in Egypt.

YEDO, YEDDO and Jeddo. See TOKIO in Japan.

YELLOW. Formerly one of the PRIMARY COLOURS; nearest to white; approaching to light gold and gall. It is a most advancing colour, and of great power in reflecting light shining on it. Compounded with the primary red it constitutes the secondary orange and its relatives, scarlet, etc., and other warm colours. Animal and vegetable yellows are much more permanent than other colours. The yellow of the petals of flowers is the only colour which is not discharged by the fumes of sulphureous acid; if a lighted match be held under a heart's-ease (*Viola tricolor*) for example, the purple tint instantly disappears, but the yellow remains unchanged; the yellow of a wall-flower (*Cheiranthus fruticulosus*) will continue the same, though the brown streak will be discharged. In producing photographic pictures the chief difficulty is in taking the yellow colours. Yellow with brown is represented in metals by quartz, and massive quartz with oxide of iron.

The earlier Greek painters used Attic ochre for yellow. A paler sort of sandarach; orpiment, or sulphuret of arsenic (auri pigmentum); several sorts of ochre of which the Attic was most esteemed; it cost two denarii or 1s. 3½d. The ochre of Achaia was used in shades and cost 4d. The Gallic, or shining ochre was used for lights, and was still cheaper; *Pompeii*, 8vo., 1836, ii, 52, 57.

Aureolin, cobalt yellow; cobalt, potassium and oxide of nitrogen, a rich brilliant, transparent colour, mixes easily with other pigments, and useful in oil, water, or fresco, very permanent.

Baryta yellow, yellow Ultramarine, or Lemon yellow. The true Lemon yellow. Neutral chromate of baryta.

CADMIUM yellow, Cadmia (Fr. *Jaune brillante*). Sulphide of Cadmium.

CHROME yellows; (Fr. *Jaune minéral*) Cologne yellow, Pale and Deep Chrome, Orange Chrome, Citron, Leipzig, or Paris yellow. Chromates of lead.

GAMBOGE, Camboge, Cambogia, etc. A vegetable yellow.

Indian yellow, or Purree or Powre. Uriphosphate of lime.

King's or CHINESE yellow, ORPIMENT or AURIPIGMENTUM. Arsenious sulphide. Natural and artificial.

LEMON yellow. Chromate, carbonate, and sulphate of lead.

Massicot or Masticot. Protoxide of lead.

NAPLES yellow (Ital. *Giallino*). Now compounded of zinc; formerly lead oxide.

Yellow LAKES; Madder yellow, Italian, English, and Dutch pink, Quercitron yellow or lake. Vegetable dyes on earthy bases.

Yellow ochres; yellow ochre, Jaune de fer, Jaune de Mars, Sienna or Raw Sienna. Hydrates of iron, and peroxides of iron. OCHRE; Oxford, Stone, Roman, Brown, Terra di Sienna, Red, and Orange.

STANDAGE, *The Artists' Table of Pigments*, fol, 1883.

Yellow ochre, and mineral yellow (Ital. *terra di palito*). A native pigment found in most countries and abundantly in our

own. They are not subject to change by ordinary light, nor much affected by impure air or action of lime; by time and the direct rays of the sun they are somewhat darkened, and by burning are converted into *light reds*. 7. 14.

Besides the above colours are GOLD, TURNER'S, CASSEL, Montpellier, or PATENT; and Capuchin yellow madder; sulphur, straw, wax, honey, iodine, iron, queen's, wine, cream, etc.

YELLOW BRICK. The "yellow malm" formerly used for the facing of buildings. The large block erected 1855, at the west end, and on the south side, of Threadneedle street, London, is faced with "yellow malms" set in a "grout joint", which should be one-eighth of an inch thick, or at most three-sixteenths. This facing had to be cleaned down. A solution of spirits of salt failed. Grinding the face with a piece of "sharp fine-grit York stone" was successful. It was found that the face or outside skin of the brick had been rubbed off in the manipulation of the gauged work, and hence the deposit of soot in the open pores in the bricks; as explained in the *Journal of the Clerks of Works Association*; Sept. 1886, p. 809.

YELLOW MARBLE. See GIALLO ANTICO. HYMETTIAN MARBLE. *Nubidian Marbles*, by GRAHAM, in *ROYAL INST. OF BRIT. ARCHITECTS, Journal*, 1886-7, p. 117-8.

YELLOW METAL. See MUNTZ'S METAL; ALLOY; and ZINC.

YELLOW also called RED TIMBER. The product of *Pinus sylvestris*; Swedish timber. PINE TIMBER. PITCH PINE. "Yellow pine" is *Pinus variabilis*, is used for internal work; "Pitch pine" is *Pinus resinosa*, for joiners' work generally; "White pine" is *Pinus strobus*, for mouldings and framing; and "Red pine" is *Pinus rubra*, for carpenters' and joiners' work. "Yellow timber" is named in 1660; (*Harleian MS.* 1656, p. 34). Yellow fir, 1721 used for roofing Oxford chapel, Vere street, designed by J. Gibbs, (*Add. MS.* 18,238, p. 37b, etc.). "In all purposes to which deal is applicable, I have found English grown fir equal in strength and durability to any foreign deal whatever. Scotch fir, (undoubtedly the real yellow deal), is seldom so delicate a grain as the foreign yellow deal; but this is entirely occasioned by the rapidity of its growth, and its having too much room to throw out large side branches. Lord Bath's Scotch firs, which are known to have been planted in 1696 are from 2 to 3 ft. diam., whereas the best Christiania deal, although evidently 100 years old, is seldom above a foot in diam.;" DAVIS, in *SOCIETY OF ARTS, ETC., Transactions*, 8vo., London, 1798, xvi, 124-5. *Yellow Timber*, in paper by BAILEY, in *CIVIL ENGINEER, ETC., Journal*, 1843, vi, 405-6, 432; and *Timber and Deals*, by BRITTON, xxix, 27-32. LASLETT, *Timber and Timber Trees*, 8vo., 1875. The difference between "white" and "yellow" Norway deals is greater than between American yellow pine and Baltic timber. "American yellow" is softer than Baltic, and superior where it can be used without being in contact with ground or masonry, for certain purposes and when freely exposed to air, is more easy to work, having less number of knots, knots dead and liable to fall out, generally free from defective parts as sap, etc., shrinks less and holds glue better, grain finer, cuts thinner; the grain is different. Baltic timber is generally "die square" end to end, but the Canadian generally is not so, because they could only bring very short timber, as the tree grows very tapering. Nearly all the joiners' work in Scotland is *yellow pine*; it is seasoned for years in piles of boards. In the Canadian trade, it was badly cut at first, the sound not separated from the unsound; but later it was selected with great care. It does not warp or change, is easily worked, and is very free from knots. A granary built of Canada yellow pine appeared in 1855 to be as perfect as when erected in 1825; *BUILDER Journal*, xiii, 388. A fence of unpainted thin *yellow deal* feather-edge boards, six from the 3-in. deal, presented no appearance of decay after seventeen years' use; *idem*, 1850, viii, 188.

Experiments on the strength of American red pine from Upper and Lower Canada, were made for the Britannia bridge

works; *BUILDER Journal*, 1850, viii, 434, 452. On American yellow pine, in *CIVIL ENGINEER, ETC.*, *Journal*, 1842, v, 178. The strength of White pine, Spruce, and Southern pine are as 1, 1.111, and 1.807; *PHILLIPS, Facts*, 8vo., 1832, p. 387.

YENN (JOHN), R.A., F.S.A., was 1760 a writing clerk in the board of works; 1771-6 pupil of sir W. Chambers; 1769 student at the royal academy of arts in London; 1771 gained its gold medal for "a nobleman's villa"; 1774 elected associate; 1791 academician; 1796 appointed treasurer under the king's sign manual, and resigned it 1820 (*Report of the Academy*, 4to., 1860, p. 78); 1780 clerk of the works at New Park lodge; 1783 Feb. 7 at Kensington, and at the king's mews; 1788 Sept. 27, appointed surveyor to Greenwich hospital, on the death of sir R. Taylor who had held it only for a few months, (*ROY. INST. OF BRIT. ARCHITECTS, Journal*, 1890-91, p. 418); and 1796 was clerk of the works at "The Queen's house", Frogmore? He exhibited from 1771 to 1797 many designs, including 1778 mansion now building at Hadsor, Worcestershire; 1779 nobleman's house at Ealing Grove; 1781 additions to a house at Aston, Oxfordshire; entrance to Blenheim park from Ditchley road, for duke of Marlborough; mansion at Colby, Lincolnshire; 1791 town hall and market house at Llanfyllen; a temple in Blenheim gardens; and 1796 window side of two rooms as executed in east front of Windsor castle. His diploma drawing 1791 at the academy; sketches in the library of the Institute, one is dated 1777. "A series of 46 working drawings, some laborious", priced 7s. 6d. in a catalogue of J. R. Smith, Soho square, 1851. Henry Hakewill was a pupil. Engraved portrait in south drawing-room at sir John Soane's museum, from a painting by Rigaud, engraved by Sherwin, published June 15, 1785, by himself at No. 9 Charlotte street, Bedford square. He was an original member 1791 of the "Architects' Club." He died 1st March 1821, aged about 74 to 77, at Gloucester place. SANDBY, *Royal Academy*, 8vo., 1862, i, 229. The narrative in ELMES, *Hist. of Architecture*, in *CIVIL ENGINEER, ETC.*, *Journal*, 1847, x, 300, is incorrect. W. P.

YEOT. Leading-in of iron work. See YOTE.

YERD and YERDE. Old ways of writing YARD.

YEVELE (HENRY DE), also written Yeflee, Yevelee, Yeveley, Yevill, Yenele, Ivelleigh, Zyevelye, Zeveley, Zeneley, freemason, son of Roger, was master mason to kings Edward III, Richard II, and Henry IV. Of his immediate parentage or family nothing has been discovered; Yeovil, Ilfley, Yeaveley near Stidd in Derbyshire, have been assigned as his probable birthplace. The following notes afford the most complete account of a clever medieval mason, or architect, yet obtained, even above his contemporary, W. de WYNFORD.

1356, 30 Edward III; "Regulations for the Trade of masons", by the mayor and aldermen of London, and others, "between the masons who are hewers on the one hand, and the light masons and setters on the other", Henry de Yevelee was one of six who appeared on behalf of the masons hewers; (*RILEY, Memorials of London, etc.*, 1868, p. 280-2; and partly in GOULD, *History of Freemasonry*, 4to., 1883, ii, 341-3). 1365, director of the king's works at Westminster, receiving 1s. per day, the usual wages; and supplied 7000 Flanders tiles for pavements at 6s. 8d. per 1000, and six mounceils of plaister of Paris at 12s. the mounceil; (*BRAYLEY and BRITTON, Palace, etc.*, 8vo., 1836, p. 189, 196). 1366 supplied 13 tons of Stapleton free stone at 8s. per ton for the works at Rochester castle; (*Archæologia Cantiana*, 8vo., 1859, ii, 112; and *FREEMASONS' MAG.*, vi, 404). 1370 employed to retain 25 masons to be sent in the king's retinue over the sea for nine days, and he received £5 12s. 6d.; (*DEVON, Brantingham Roll*, 4to., 1835, p. 3). 1376 July 1, tenant of the manor of Langeton in Purbeck; (*Rot. Pat.* 50 Edw. III, m. 13). 1381 engaged thirty *latomos* for the king; (*RYMER, Collections*, in *Brit. Mus., Harl. MS.* 4592). 1381 the south aisle to the church of S. Dunstan in Thames street, for John lord Cobham, was to be built for 25 marks by N. Typer-ton, mason, "solom la devyse mestre Henry Ivelleghe"; (*Inden-*

ture in British Museum, *Harl. Charters*, 48 E. 43, as printed in MURRAY, *Church of S. D.*, 4to., 1859, p. 10). 1381 29 Sept., as "masoun et citezein de Loundres", he had received from lord Cobham the sum of £20 due to Thos. (Wrek, Wreck) Wrewk, of London, mason, for works at Cowling castle, Kent; and 1382 July 23 employed to measure the work done at Cowling castle by Wm. Sharnale, amounting to £156, of which £270 10s. 4d. was paid the same day; (*Freemasons' Magazine and Masonic Mirror*, 1862, new series, vi, 403; 383). 1383-4 Feb. 20, confirmed in the possession of two shops and 4s. yearly rent, in the parish of S. Martin Oteswicke, etc.; conceded in consideration of the great labours which Henry daily sustained in the royal service (*Brit. Mus., Harl. Charters*, with seal in white wax, 43 E. 28; Letters patent 7 Richard II); and another indenture concerning a rent of 40s. (58 D. 30). 1387-8, 11 Richard II, chief mason of the new work in Westminster abbey; at a fee of 100s. per ann., and 15s. for his gown and furs. 1394-6 also named as chief mason; (*SCOTT, Gleanings*, 8vo., 1861, p. 28, and in App. p. 26); he was succeeded 1399-1400 by W. of Colchester. 1395 March 18, an indenture concerning the works at Westminster hall, the work to be done "according to the purport of a form and model made by the advice of master Henri Zeveley, and delivered to the masons by Watkin Waldon his warden; (*Rot. Pat.* in Turri, 17 R. II, i, 3; *STRYPE, London*, ii, 627; *RYMER, Fœdera*, edit. 1740, vii, 794; *BRAYLEY, Palace*, p. 437-9.) J. GODMANSTON was clerk, 1394-6; and J. BUTERELL, 1397. 1394-5 Nov. 26, receipt of Yevele and S. Lote for £20 from the abbot of Westminster in part payment for the tomb of cardinal Langham; (*Hist. MSS., Royal Commission, Fourth Report*, p. 179; in 1872 it was exhibited in a case in the chapter house.) 1395 April 1, indenture relating to the "tomb of fine marble" for the king, and his queen Anne, recently deceased; by H. Yevele and Stephen Lote, citizens and masons of London; according to a pattern remaining with these two masons under the seal of the treasurer of England; to be finished by Mich. 1397 for £250; the tomb still exists; the effigies by two coppersmiths of London; (*RYMER, Fœdera*, vii, 795; *PALGRAVE, Calendars of the Exchequer*, 1836, ii, 50; *DEVON, Issue Rolls*, 4to., 1837, p. 232, 258, 263-4, 270; *NICHOLS, Archæologia*, 1842, xxix, 32-59; *NEALE, Westminster Abbey*, 4to., 1818-23, ii, 111). He possibly had something to do with "the rebuilding of the ancient isle of the church of the hospital of S. Thomas the martyr of Southwark where the poor inmates lie", as in his will.

He made a long and precise will 25 May 1400, and dying soon after, it was enrolled 28 October, in the court of Hustings at Guildhall, 1 Henry IV, m. 3 (R. R. SHARPE, *Calendar of Wills*, 8vo., 1890, ii, 346, 924), by John Clifford, mason, and Martin Seman, clerk, his executors; S. Lote was another. He was buried in the chapel of S. Mary in the church of S. Magnus, near London bridge, where his tomb was already built, and existing in the time of Stow, *Survey*, 1598, p. 167, but perhaps then defaced as the epitaph is not supplied. *NICHOLS, Life of Yeveley*, in *LONDON and MIDDLESEX ARCHÆOLOGICAL SOCIETY, Transactions*, 1865, ii; reprinted in *BUILDER Journal*, xxiii, 409; and *GENTLEMAN'S MAGAZINE*, ii, 38, rendering the notes of WALPOLE, DALLAWAY, ANDERSON, PRESTON, etc., needless for reference. *SMITH, Antiq. of Westminster*, 4to., 1807, p. 172.

YLE. An old way of writing AILE or AISLE. 2. 19.

YIMAGE, ymagerie, ymageour. Old ways of writing IMAGE; and imager or carver of images.

YORK (*Brit. Caer Eborac, Eburac and Ebrauc*; Lat. Eboracum or Eburacum, about 79 A.D., the British metropolis: became the capital of Northumbria). The capital of the county of the same name, in England, situated on the rivers Ouse and Foss. Over the former was a stone bridge re-erected 1215-56; in 1564 it had two arches destroyed by a flood with twelve houses on them, and the chapel to S. William (built 1268); it was rebuilt 1566 of five arches, the largest 81 ft. span by 26 ft. 3 ins. rise, and the soffit 16 ft. 9 ins. wide; (according to HALFPENNY;

CRESY, *Encyclopædia*, 1846). A new bridge Nov. 1810-20 was designed by P. Atkinson, of three elliptic arches, the centre one 75 ft. span, 22 ft. 6 ins. rise, the others 65 ft. with 20 ft. rise. The Foss bridge 1811 by P. Atkinson, has one elliptic arch; the old bridge 1424, had three arches, covered by houses and also had a chapel on the north side. The Lendal bridge was commenced 1860 by W. Dredge, C.E., as a lattice girder; (CIVIL ENGINEER, ETC., *Journal*, 1861, xxiv, 155); but one of cast iron designed by T. Page, C.E., 175 ft. 2 in. span was constructed and opened 1863; the lodges by his son G. G. Page; (BUILDER *Journal*, xvii, 636; xviii, 439 estimates; xix, 204, 753 abandoned, 823 new design; xx, 87 estimates, 776 cost; opened xxi, 44-5). Skeldergate bridge, 1878-81 of iron, the centre 90 ft. span, two sides of 30 ft. and two others of 24 ft.; by G. G. Page, C.E.; B. J., 1880, xxxix, 56; and 1881, xl, 358.

The city, the residence and burial place of the emperor Septimius Severus of Rome, died A.D. 211, embraces a circuit of 2½ miles, enclosed by walls, originally of Roman construction, wholly on the north side of the Ouse, and about 1680 ft. by 1380 ft.; one of its angle "multangular" towers 33 ft. diam., and a portion of the walls exist, in the grounds of the museum; the walls, restored by the Edwards I and III, part later, and 1863 and later, are entered by four Norman gateways called "bars", the barbicans added by Edward III, of which three have been removed, (CRESY, *Encyc. of Civil Engineering*, 1846; B. J., v, 118); and five posterns, with the archway from the railway station; Monkgate has an almost unique portcullis chamber; Walmgate bar walls were restored 1855 under G. F. Jones. About 1800 every street afforded some interesting specimens of XVI and XVII cent. domestic architecture, many of which have been removed. J. Carr 1755 designed a house in Petergate for J. Mitchell, esq., and one for himself. The station of the North Eastern, London and York and North Midland, York, Newcastle, and Berwick, railways, 1874, opened 1877 with a platform 1500 ft. long, was said to be the largest in the world; its curved form gives some unusual effects in perspective; (BUILDING NEWS *Journal*, 1877, xxxiii, 244. B. J., 1874, xxxii, 412; 1877, xxxv, 671).

Harold 1066 was feasting here after the battle of Stamford bridge. William I built two castles. Henry II resided at York, and 1230 and 1251 Henry III held assemblies there. 1327 Edward III was married to Philippa. 1478 Edward IV feasted; and there Richard III was to have been recrowned. Henry VIII established 1537 in the abbot's house, built *cir.* 1485-1502, a council for the government of the northern counties; who called it "the king's manour"; the king ordered a new palace for himself adjoining the house and 1541 stayed there twelve days, it shortly became a ruin and only a large vault remains, which has been built over for the safety of the school-children. In 1568-70 the old house was repaired and added to; soon after 1572 or about 1580, the earl of Huntingdon added the large and stately brick buildings on the north-west side and perhaps partly on the site of the abbot's house; one fine room is now used as a dormitory for the school. In 1609 an estimate was made of the necessary repairs, 1616 lord Sheffield obtained a grant, and in 1624 submitted an account of £3301 4s., which may have included the cost of the erection of the large block of building which now forms the northerly side of the principal quadrangle. King Charles was there in 1633-4; and about 1636 lord Wentworth built a gallery and a chapel; Charles was again at York in 1639; and in 1641 and 1642, but it is supposed the manor at that time was dismantled. 1692-1773 it was converted partly into dwelling-houses, school, mint, etc. It is at present used as the Wilberforce school for the indigent blind, and by the National school for boys. DAVIES, *The King's Manour*, in ASSOC. SOCIETIES, *Reports and Papers*, 1869, x, 244, with plan, view, and estimate of Dec. 1609, "made by the judgement of skilful workmen". A banqueting room 81 ft. long by 27 ft. wide, has a kitchen under it with its large fireplace and chimney.

King Edwin 624 made York an archiepiscopal see; and from the time of arch. Egbert (735-766) to the end of the century its school attracted students from all parts of the kingdom, France and Germany, and sent out scholars who acquired an European fame. The minster or cathedral, dedicated to S. Peter, dates from VII cent.; in 669 Wilfrid repaired the walls and roof. 763-7 Albert rebuilt it (ALCUIN, *De Pont. et Sanct. Eccles. Ebor.*) of which period is the inner or central wall of the crypt. 1069 burnt by the Normans. Thomas repaired, and then 1070-1100 rebuilt it, of which period may be the herring bone work at the west end of the crypt. 1154-81 Roger pulled down the choir, etc., the east part of the crypt is considered to be his work; (ROBINSON, *Newly Discovered Crypt, etc.*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 4to., 1835, i, 105, with plate). 1215-55 or 1220-41, the south transept with the superb rose window 22 ft. 6 ins. diam.; the tomb of Walter Grey (died 1255) therein; restored 1871-8 by G. E. Street, R.A.; (his *Report* 1871, in B. J., Nov. 1871, xxix, 872) who states that the transept excelled the work of most of the artists of XIII cent.; and its dimensions are unusually large; (B. J., 1874, xxxii, 963; 1880, xxxix, 369, 513; ASSOCIATED SOCIETIES, *Reports and Papers*, 1874, lxxi; B. N. J., 1879, xxxvi, 519; ARCHITECT *Journal*, 1874, xii, 264). *Cir.* 1255, north transept, the five lancets or "sisters" are each 5 ft. 7 ins. or 5 ft. 2 ins. wide and 54 ft. high, having fine coloured early English glass. 1285-1345 nave rebuilt (Decorated); 1338 west window glazed; 1355 wood ceiling. This part was restored 1747, and also by S. Smirke, R.A., after the fire of 1840; new roof 49 ft. clear span, (ILLUSTRATED BUILDERS' *Journal*, 1865, p. 92. 1361-73 *Lady chapel* and presbytery, largest east window in the world, 32 ft. wide and 75 ft. high in the glazing. 1373-1400 the choir, restored after the fire of 1829; new stalls, etc., by sir R. Smirke, R.A. The glazing contract 1405 with John Thornton of Coventry, (B. N. J., 1858, iv, 588; and *Fabrick Rolls*. Sir R. SMIRKE, *Report on the Removal of the Choir Screen*, 8vo., 1830; two plates fol. were also published showing the difference of site. S. SMIRKE, two *Reports* on the works of choir and nave, are printed in SUNVEYOR, ENGINEER, ETC., *Journal*, 1842, iii, 155-7. New reredos by G. E. Street, the centre compartment of terra cotta by G. Tinworth, B. J., 1880, xxxviii, 342. The S. Cuthbert's window in south transept of choir renewed, etc., 1885 (J. T. FOWLER in *Yorkshire Arch. Jour.*), opposite to the S. William window of fifty years earlier date. 1337?-40, date uncertain, *Chapter house*, octagonal with forty-four canopied stone stalls with a gallery over; glass *temp.* Edward II and III; restored from 1830 by S. Smirke, R.A.; (roof in B. N. J., 1869, xxv, 25, 79, 101, 175, 199, 213); its vestibule 1335-50. *Towers*; 1450 upper story of south-west tower in which the fire of 1829 commenced. 1480 *cir.* upper story of north-west tower. 1470-2 central tower completed. The three last are also dated 1405-70. Church consecrated 3 July 1472. Fragments of north cloister of early part of XII cent. Organ screen 1476-1518.

The length outside is 519 ft. (524 and 551) from base to base of buttresses; at the transepts 249 ft. Inside length 486 ft. (from west door to the choir 264 ft., the choir 162 ft., and with the presbytery 223 ft.), transepts 223 ft. Width of nave 48 ft., and with aisles 104 ft. (109); choir 99 ft. Height of nave 93 ft.; choir 101 ft.; south transept 94 ft.; north transept 91 ft. 6 ins. Central tower 198 ft. (216) external, and 188 ft. internal height. Western towers 32 ft. square, 201 ft. to top of pinnacles, 172 ft. high (178 ft. 3 ins. to top of battlements). Chapter house 57 ft. diameter, or 60 ft. 6 ins. across the angles, no central shaft; and 67 ft. 10 ins. (62 ft. 2 ins.) high in the centre.

List of master masons and others to the cathedral:—

- 1332 Simon le masoun.
1344 Roger de Hirtou. Willelmus de Wrsal was "submagister operis fabricæ".
1347 Thomas de Loudham, or Ludham, dominus, but error in BROWNE.

- 1348 before, to 1350 Thomas de Patenham or Pacenham, a native of the south.
- 1350 William de Hoton, of Yorkshire?; 1351 pension or salary. 1350-74 Philip de Lincoln, master carpenter.
- 1351-60? William de Hoton junr.
- 5 Jan., 1368-70 Robert de Patrington, 1368 salary, of Yorkshire? Choir chiefly.
- 1390 Hugh de Grantham was a mason.
- 1398-1401 Hugh de Hedon. Eastern part of choir, and crypt completed.
- 1415-19 or 20 William Colchester, sent from Westminster abbey by the king.
- 1421-33 John Long. 1433-42 Thomas Pak
- 1442-43 John Bowde or Bodde. 1445-47 or 56 John Barton.
- 1456-66 John Porter, 1450 sent for from Lincoln by the chapter.
- 1466-72 Robert Spillesby; roof of central tower completed.
- 1472-1505 William Hyndeley, warlen under Spillesby, from Norwich; the roof screen: will 24 June 1505.
- 1505 Christopher Horner, will 12 Feby. 1522-3.
- 1526-37? John Forman completed the works.
- 1770-78 John Carr as architect to the building made a general survey and it was put into general repair.
- 1802-27 W. Shout or Shutt (not Shute): restoration of west front and towers; the figures by M. Taylor of York; south side of lower roof of nave; and east end.
- Dec. 1827-1834 John Scott master of the masons. He was succeeded by Bannister, foreman of masons, Taylor, Dent, Thos. Temple, and George Bradley from about 1871.
- 1829, fire of 2 Feb., in choir; restored under sir R. Smirke, R.A.
- 1840, fire 20 May, in south-west tower and nave; 1840-45 restored under Sydney Smirke, R.A. Allan, clerk of the works.
- 1871-80 South transept restored under G. E. Street, R.A. Cain, clerk of the works for a short time.
- 1882 G. F. Bodley appointed architect to the building. B. J., xlii, 482.

Stone. Harness Hill quarry, about forty miles from Roche abbey quarry, now abandoned, supplied very much stone, and to get it to York, a dike was formed direct from it and the Huddlestone quarry to the river Wharfe and thence into the Ouse. When this communication failed in the winter, the stone was put into panniers and conveyed by mules or horses from the quarry to the minster; hence few large stones are to be seen. Maguesian limestone from near Tadcaster, Huddlestone near Sherburn; and near Stapleton (Pontefract) were also used. In the south transept the clustered piers are of Tadcaster stone and Purbeck marble.

Accurate Description of the Caths. of Canterbury and York, fol. 1755, 1783. HALPENNY, *Gothic Ornaments*, 4to., 1795, 1806. STORER, *Cathedrals*, 8vo., 1814-9. WINKLES, *Cathedrals*, 8vo., 1836-42. WILD, *Views*, fol., 1809. WILLIS, *Survey of Cath.*, 4to., 1727-30. BRITTON, *Metropolitan Church*, 4to., 1819, 1835. BROWNE, *History of the Med. Ch. of S. Peter*, 4to., 1847. WILLIS, *Arch. History of Cath.*, for the ARCHEOLOGICAL INSTITUTE, 1846. POOLE and HUGALL, *Guide to Cath.*, etc., York, 1850. WYLLSON, *York Minster, its Fires and Restorations*, B. J. 1845, iii, 158, 175, 202. GENT, *Deser. of York Minster*, 12mo., 1768; and *The East Window*, 8vo., 1762. PUREY-CUST, *Heraldry of York Minster*, 4to. SURTEES SOCIETY, *Fabric Rolls*, 8vo., Durham, 1859; reviewed B. J., 1859, xvii, 832. KING, *Northern Cathedrals*, 8vo. (Murray), 1869. GAILHABAUD, *Monumens*, 4to., Paris, 1850, iii. *Illustrations*. Bell, pl. 33; and Church Plan, pl. 86. 14. 50.

On the north side is a good Early English chapel formerly belonging to the archbishop's palace, repaired by dean Markham (1802) for the library: parts of its cloisters 1070 remain. The deanery 1827-32 was designed by ... Watson and J. P. Pritchett. A house, completed 1826 for the canons residentiary. The treasurer's house, 1696, is now divided into tenements. Bedern, the former residence of the thirty-six vicars choral, founded 1252 on site of the palace of the Roman emperors; now let in mean tenements. The palace at Bishopthorpe was erected by bishop Walter de Grey (1216-55); the stables, washhouses, entrance gateway, lodge, etc., 1763-5 by T. Atkinson, who 1765-9 designed the chapel, the Gothic central block, etc.; much of the stone came from Cawood castle, another residence. PATERSON, *Book of Roads*, edited by Mogg, 8vo., 1822, p. 283; BROWNE, *York Cathedral*, 4to., 1847. Two large views by Rooker with the original drawings are in the British ARCH. PUB. SOC.

museum, the King's collection. ILLUSTRATED LONDON NEWS, 1844, v, 221.

The fine ruins of the Benedictine mitred abbey of S. Mary (formerly S. Olave), from which in 1132 thirteen monks seceded and founded Fountains abbey under the Cistercian rule. The site consisted of about 15 acres and was surrounded by walls with towers; the Norman arch on north side was the principal gateway of the abbey and now forms the curator's residence. A great part completed by William Rufus (1087-1100). The vestibule of the chapter-house *cir.* 1154-81, is transition Norman to Early English; the nave, 1270-94, of which the north wall, part of west front, four piers of the central tower, and bases of several pillars only remain; the church was 371 ft. long by 60 ft. wide (B. N. J., 1877, xxxiii, 6). The *hospitium* of two floors, stone below and timber (modern) above, has been restored and now used for part of the valuable museum of antiquities of the Society in the grounds. In 1827 the site was explored for the Society of Antiquaries and published in *VERUSTA MONUMENTA*, fol., 1835, v, pl. 51-60. The Soane medal prize of the roy. inst. of brit. architects, was 1838 awarded to S. Sharp for a restoration. In *temp.* Henry V (1413-22) there were forty-five parish churches and fifteen chapels:—

- All Saints, Pavement; Perpendicular; good octagonal west lantern, rebuilt 1835 after old design. Pulpit 1634.
- All Saints, North street; outer walls and windows Perpendicular; pillars, arches, south doorway and font, Early English; rich stained glass in east window XV c. ent., contains the Bede's window. Spire 120 ft. high. Restored 1861-7 by messrs. Atkinson. KERRY, *Hist. and Antig.*, in ASSOCIATED SOCIETIES, *Reports and Papers*, 1867, ix, 57-69.
- S. Dionis or Denis; Norman south door, and Early English; and glass; east window like that of the minster; nave destroyed 1798. Tower rebuilt 1847 and church repaired.
- S. Olave; late Perpendicular with square tower; repaired 1705. Chancel added 1879, by G. F. Jones.
- S. Lawrence; Norman door, and old square tower. Church rebuilt.
- S. Man ice; rebuilt 1875-7. Curious and early west window.
- S. Margaret; rich Norman porch and gateway, showing signs of the Zodiac; tower rebuilt 1684. To be restored 1863.
- S. Mary bishophill the elder; Early Eng. and Dec. work; restored 1860. Brick tower 1659 or 1639.
- S. Mary bishophill the younger; a tower probably Saxon or rebuilt of Roman materials and patched later; two arches on the south side of the nave are curious. Norman and Decorated work. Restored 1860 by messrs. Atkinson.
- S. Michael le belfry; rebuilt 1525-37 by John Forman for the dean and chapter; the largest church in York; a bell-cot on west gable; glass *temp.* Henry VIII: 1867 partly restored by G. F. Jones.
- S. Michael; plain Perpendicular; good glass. Renaissance reredos.
- Holy Trinity, Micklegate; Decorated, chiefly Perpendicular; glass 1470. Restored 1850; gateway destroyed 1855. Chancel 1887, by Fisher and Hepper.
- Holy Trinity, Goodramgate; 1348, Perpendicular. An oblique opening to see from outside. Mutilated.
- Christ Church; restored 1862. South door, Decorated.
- S. Helen's on supposed site of Roman temple; Decorated; octagonal west bell turret; restored 1857-8 by W. H. Dykes (B. N. J., iv, 963); west end rebuilt 1875 by W. Atkinson.
- S. Martin's le grand; late Perpendicular; large clearstory windows, rich stained glass; west window 1447; painted roof. Restored 1872.
- S. Mary, Castle gate; fine Perpendicular tower and spire 154 ft. high; restored 1870 for the dean of York. Part of dedication stone remains.
- S. Crux, Pavement; entirely removed 1855, and school built on site.
- S. Martin cum Gregory; portions of a crypt; nave Early English, clear-story Perpendicular and also chancel; windows some Decorated, and good glass. West tower.
- S. Saviour; modern; stained glass.
- S. Cuthbert; late Perpendicular; good roof.
- S. Clement, 1874; T. and W. Atkinson. Has wires across nave and chancel to correct the echo.
- S. Sampson; restored 1865 by J. Knowles; and 1875 by C. H. Fowler of Durham.
- S. John Micklegate, restored 1860, by G. F. Jones. No tower.
- S. Thomas, 1854, by G. F. Jones.
- SS. Philip and James, Clifton; 1866-7, and Trinity, Heworth, 1867-9, by G. F. Jones.
- S. Paul, Holgate; 1850 by H. Atkinson.

The Parish Churches of the City of York, in ECCLESIOLOGIST

Journal, 1846, vi, or new series, iii, 94. MONKHOUSE, BEDFORD JUMP, and FAWCETT, *Churches of York*, fol., 1847, 23 pl. ARCHÆOLOGICAL INSTITUTE, 1846.

Roman Catholic pro-cathedral of S. Wilfrid, 1862-64 by Geo. Goldie; tower 147 ft. high (B. J., 1862, xx, 699). English presbyterian church 1880, £5,000. Wesleyan Methodist Centenary chapel (Greek), 1839-40. Wesley chapel 1856, Italian, cost £10,500.

The Norman castle, 3,300 ft. in circuit with walls 35 ft. high erected 1836, enclose four acres; the noble keep (after 1068) 1220, called Clifford's tower is formed on plan, of four cylinders running into one another, ruined 1684, which with some other portions remain (ARCHÆOLOGIA, vi, 259). Within the area are also the debtors' prison 1701-8 at the further end; on the right hand the county court house 1765-77 (Ionic); and 1780 opposite to it the female debtors' prison; these two last by John Carr (RICHARDSON, *Vitruvius Britannicus*, fol., 1810, ii, pl. 1-4), with additions 1803 by P. Atkinson, senr. Also, at the north-east angle is the governor's residence 1833, with the county prison for felons of four double buildings, which with the large entrance gateway was 1826-30 designed by P. F. Robinson (COMPANION TO THE ALMANACK, 1834, p. 219, and plans). Mansion house, 1725-6 by the earl of Burlington. Guildhall at the back 1446, divided into three by ten oak pillars, is 93 ft. long, 43 ft. wide, and 29 ft. 6 ins. high to apex; of the fourteen windows nine since 1867 have stained glass (B. J., xxv, 376); magistrate's room next the river by P. Atkinson; new municipal offices adjoin, 1890-1, by E. G. Mawbey, C.E., carried out by his successor, A. Creer, C.E., city surveyor, cost £15,000; river front of Tadcaster stone. Post office 1884. Probate registry. Savings' bank. City courts of justice, police office and fire brigade station (Gothic) 1891 by H. A. Matear, cost £32,000; Museum of the Yorkshire Philosophical society in the grounds of the abbey 1827-30; by W. Wilkins, R.A., superintended by R. H. Sharp. The larger remains of the Roman period as Roman pavements, etc., are preserved in the former *hospitium* (B. J., 1874, xxxii, 65; xxxv, 381; xxxix, 598). Merchants' hall; two old rooms each 65 ft. by 25 ft.; its chapel under one 1411, and restorations, etc.; Trinity hospital adjoins. The Masonic hall 1863 by J. E. Oates (B. J., xxi, 465). York library 1812 by P. Atkinson. Concert-room 1824 by mess. Atkinson and Sharp, 95 ft. long by 60 ft. wide and 45 ft. high; adjoins the Assembly rooms 1730-6, one of the best in the country, by Richard, earl of Burlington, hall 112 ft. by 40 ft. by 40 ft. (WOOLFE AND GANDON, *Vitruvius Britannicus*, fol., 1767-71, i, pl. 78-81); in 1828 a new façade by J. P. Pritchett; and interior elaborately decorated by Owen Jones. De Grey rooms for concerts and balls. Theatre, 1 March 1731 on plan by the earl of Burlington; rebuilt 1765; and new front 1879. Market cross 1671 supported by twelve Tuscan columns, now removed (GENT, *York*, 1730, p. 163). 1772-7 county lunatic asylum by John Carr; remodelled 1814; church 1865; Pauper lunatic asylum at Clifton 1847, enlarged 1851 and 1856. School for the blind in the "king's manor". County hospital founded 1740, rebuilt 1850 by J. R. and W. Atkinson (plans in ARCHITECT *Journal*, 1850, ii, 329-31; and new wards for special classes of disease; 1849-50 they designed the Yorkshire Agricultural and Commercial bank, cost £4,000 (plan *idem*, ii, p. 402-3); and the Yorkshire and City bank (B. J., 1875, xxxiii, 38). Corn exchange 1868 by G. A. Dean (B. J., xxvi, 819). Cavalry barracks 1796 and enlarged 1861. Infantry barracks on a site of 35 acres for 1,100 men and officers' quarters, with armoury and powder magazine, cost £150,000 (B. J., xix, 775). Volunteer drill shed 90 ft. by 60 ft., 1872. The building for the Yorkshire fine art and industrial exhibition, held 1879 (the second) is now the Fine art and industrial institution, and contains the York school of art and science (1883-5, by W. G. Penty), and picture galleries; also technical school and library. S. Williams college founded 1460, chiefly Jacobean, by John Harper, now dwellings for families. Diocesan training school 1846. Free grammar school founded

1546, erected 1557. The S. Anthony's hospital, now the Bluecoat school for boys founded 1705, has an old Perpendicular roof; great hall 81 ft. by 27 ft. by 40 ft. on first floor. S. Peter's school, founded 1557. Greycoat school for girls 1869. Many almshouses or (formerly sixteen) hospitals, of which the oldest and most considerable was dedicated to S. Peter, changed to S. Leonard, and of which the ambulatory or cloister *cir.* 1137 by king Stephen, with the wards and chapel XIII cent., of the infirmary over, still remain. The grand-stand of the racecourse at Knavesmire 1754-5 by John Carr. S. Lawrence college of the Roman catholics near Ampleforth, 1861 by J. A. Hanson (B. J., xix, 789, 816).

GENT, *History*, etc., 8vo., 1730. SOTHERAN, *York Guide*, 8vo., York, 1796. DRAKE, *Eboracum*, fol., 1736; 1788. TORRE, *Antiq. of York City*, etc., 8vo., York, 1719. W. H. DIXON, *Fæsti Eboracensis*, Lives of Archbishops, vol. i only, 8vo., 1863. LELAND, *Itinerary*, 8vo., Oxford, 1710, i, ii, v. HARGROVE, *York*, 8vo., 1818; 1843. *A Description of York*, 12mo., 1809. DAVIES, *Extracts from the Municipal Records of the City of York during the Reigns of Edward IV., Edward V., and Richard III.*, 8vo., 1843. LELAND, *Collectanea*, 8vo., 1770, i, 22-4, 39, 45, 121. ROYAL ARCHÆOLOGICAL INST., in ILLUSTRATED LONDON NEWS, 1846, ix, 64; and B. J., iv, 362; and July 1874. ENGLEFIELD, *Ancient Buildings of York*, 4to., 1780, in ARCHÆOLOGIA, vi, 104. CAVE, *Pict. Buildings*, 4to., 1810. HALFPENNY, *Fragmenta Vetusta* 34 pl., 4to., 1807. LOCKWOOD AND CATES, *Hist. and Antiq.*, 4to., 1834. PROUT, *Antiq. of York*, fol., 18... WELLESLEIGH, *Eboracum, or York under the Romans*, 8vo., York, 1842. BRITISH ASSOCIATION, ETC., 1844, in *Illustr. London News*, v, 221. BUILDING NEWS *Journal*, 1865, xii, 437, 505. RAINE, *Historic Towns*, York, 8vo., 1891. *Builder Journal*, 1878, xxxvi, 372.

ALLEN, *History of Yorkshire*, 4to., 1828-31, 3 vols. LAWSON, *Collection relating to Churches in Yorkshire and Ripon*, 8vo., 1840. HATTON, *Churches of York*, 8vo., 1842-5; 1880. W. SMITH, *Old Yorkshire*, 2 vols., 8vo., 1881-4. RICHARDSON, *Monastic Ruins of Yorkshire*, fol., 12 parts, 1843-59. HEALEY, *Castles and Country Houses in Yorkshire*, 4to., 1886, over 50 pl. *Handbook to Yorkshire* (Murray), 8vo., 1869. BAINES, *History, Directory, etc., of County of York*, 2 vols., 12mo., 1823, with *List of the Seats*. PHILLIPS, *Geology of Yorkshire*, 4to., York, 1829. NEALE, *Views of the Seats of the Nobility*, 4to., 1844. NICHOLSON, *Etchings of Saxon and Gothic Remains*, 4to., 1813. GRAINGE, *Castles and Abbeys of Yorkshire*, 8vo., 1855. SHEAHAN AND WHELAN, *Hist., etc., of York and East Riding*, 8vo., 1855. BAINES, *Yorkshire Past and Present*, 4 vols., 4to., Leeds (1871). WHEATER, *Some Historic Mansions of Yorkshire*, 4to., Leeds, 1889.

YORK (EGBERT OF), archbishop 732-766, commenced the rebuilding of the cathedral after the fire of 741; SURTEES SOCIETY, *The Pontifical of Egbert of York*, 732-66, 8vo., 1853. ALBERT, archbishop 766-82, completed the cathedral; ALCUIN, *De Pontif. et Sanct. Eccl. Ebor.* EANBALD, his successor 782-96, and Alcuin, two pupils of Albert, are commemorated as having "built, at the command of their master, both unitedly and with their whole heart pursuing the work" the church of that city; BROWNE, *History of York Cath.*, 4to., 1847, p. 4. EANBALD II, a pupil of Alcuin, succeeded 796-812, continued the works. 19.

YORK GUM TREE. See EUCALYPTUS.

YORKSHIRE BOND, or flying, or garden wall, bond, is chiefly used in building garden walls, one brick thick; the face shows three or four stretchers to one header; or five courses of stretchers to one of headers. One of the earliest existing if not the earliest edifice in England of modern bricks is Little Wenham hall, Suffolk, dated about 1260 or 1280, of which TURNER, *Domestic Arch.*, 8vo., 1851, p. 151, states that the walls are chiefly of bricks mixed in parts with flint, and that the bricks are mostly of the modern Flemish shape, with others resembling the Roman bricks or tiles; the bond is very similar to what is frequently called Yorkshire or flying bond; these bricks are 9½ ins. long, 4½ ins. wide, and 2½ ins. thick. BRICK (p. 137).

YORKSHIRE CEMENT. The same as Mulgrave, Whitby, or Atkinson's cement.

YORKSHIRE LIGHT. A term used in Lancashire, for a sliding sash.

YORKSHIRE STONE. The normal composition of the whole of this series of useful rocks is that of a fine-grained quartzose sand and decomposed felspar with an argillaceous cement, and with numerous flakes of mica in the planes of stratification. The mass is sometimes coloured by the presence of the oxide of the silicate of iron, and the colour varies from a decided bluish-green to a light ferruginous brown. The best stones stand well as flags for paving purposes, but when used in walling, they do not stand well "between wind and water", and must not be used in basements and plinths in contact with damp earth.

Yorkshire stone or Grit, is a name sometimes given to Bramley Fall stone; it is one of the most general of the sandstones sent to London, and is used for paving, copings, and other rough work; BREESE, *Glossary*, 8vo., 1853. "Many building stones are affected injuriously when placed in the interior of buildings, more especially Yorkshire landing, which prematurely decays, and in a comparatively short time loses its compact laminated mineral character. Such a result was well illustrated in the paving of the halls and corridors of the old India House in Leadenhall street, London"; REID, *Treatise on Concrete*, 8vo., 1869, p. 56. FANSHAW, *Effect of Climate on Yorkshire Paving*, in *Papers of Corps of Royal Engineers*, 8vo., 1839, iii. RAWLINSON advocated the use of artificial paving, as Yorkshire was found to deteriorate so fast: a reply explained the cause as due to false economy, and stated that in the same locality, "best quality blue hard Idle (Leeds) flags—honestly squared full to the square—with chisels only and not mutilated by pitching tools, are without a flake"—after forty years' wear; R. R. ROWE, in *Builder Journal*, 1889, lvii, 194, 212. Artificial paving was also advocated by the surveyor of the Fulham district, in his *Report for 1890* (October 1891).

There are about sixty different sorts of stone in use in Yorkshire—Huddersfield, Halifax, and Leeds are the centres. There are about six quarries at Crossland Moor, about three miles from the first town, about 30 ft. deep, having a warm tint and used for outside work. Exhibition of 1851, *Jurors' Reports*; and B. J., 1851, ix, 685-6. MEMOIRS OF GEOLOGICAL SURVEY, *Mineral Statistics*, 8vo., 1858, pt. 2, 8vo., 1860, Yorkshire stone, p. 222-40. In HALIFAX district, are the quarries of Mount Tabor, Ringby, Northowram, Hipperholme, Shebden head, Cromwell Bottom, Lightcliffe, Brighouse, Southowram, Rastick, and ELLAND or EALAND EDGE, Barksland, which form almost a complete circle around it; B. J., 1890, lviii, 221-3. Other quarries in Yorkshire:—Wakefield. Bradford. Shipley, fine grit, lightish brown. SCOTGATE ASH quarries, Pateley Bridge. Gipton wood or HAREHILL. BRAMHAM MOOR. SPINKWELL and Cliffwood. PARK SPRING, landings and slabs. Robin Hood or PARK NOOK quarry; landings and slabs; and for inside work; bluish. POTTER NEWTON, blocks and slabs. HAREHILL, blocks and slabs. Bretton, landings and slabs. SPRINGFIELD. WHITBY STONE. Idle. Endon quarries near Macclesfield; stated to be better than ordinary York stone. (Forfarshire stone, in contrast with Yorkshire.)

A cubic foot weighs about 145 lbs.

Yorkshire stone is supplied "self-faced", tooled, rubbed or polished, and sawn, from 1½ in. to 4 ins. thick, and more if required.

Two Flags 3 ft. bearing, 1 ft. by 2 ins. thick or deep, weighing 75 and 80 lbs.; the former broke with 1,021 lbs., the latter with 920 lbs.

1½ inch cube Yorkshire paving with the strata, 12,856 lbs. crushing; and against the strata, also 12,856 lbs. Strong Yorkshire, mean of nine experiments crushed with 9,824 lbs. per sq. inch; and weak specimens 3,000 to 3,500 lbs.

Crushing weight—Bramley fall, 2 inch cube 6,053 lbs.—1½ in. cube 13,632 lbs.

Cracking weight—Darley Dale, Stancliffe, 26,014.5 lbs.; Heddon, 7,366.5 lbs.; Park Spring, 15,866 lbs.—all 2 inch cubes.

The LEEDS district. *Sandstone grit* is obtained at Bramley, Horsforth, and MEANWOOD; the original BRAMLEY FALL quarries are nearly exhausted. Considerable variation in the regularity of the grit. Small pebbles are called "hummers"; a "lace" is a crack or break in the stone, so close as only found when under the mason's hand. The surfaces when disjoined show a brownish substance, "powdered" as it were upon them. Sometimes a rough belt runs through the stones; such are called "ranky". The gritstone is very absorbent, and water will "follow" through the walls where the headers extend quite through. Sometimes the weather wears away alternate laminae, thus channelling the surface. Stones are sometimes discoloured (yellowish) particularly from the top beds, but they bleach. Pure stones, wrought and dry, are white. The rough grain and loose texture prevent the stone from being well rubbed. Tooling, puncturing, channelling, etc., do well. *Sandstone* is obtained at Chapeltown, Harehills, and Gipton Wood. The last is the standard of quality, but equal quality is obtained from some of the other quarries, though not from all so uniformly. The colour is a light warm grey, compact, and equal in texture; not particularly absorbent. It is rendered in shapeless masses, not in parallel beds. It is an excellent stone for polished (rubbed or cleansed) work, and in that state is the most durable. Some of it acquires a "skin", and in that case will preserve well. Stones of large size are obtained. Park Spring was most esteemed some years ago, but it is now out of favour. At Woodsley House the surface of the pannels of a pier was worn, though not that of the styles, etc. *Delph stone* is used for landings, flags, etc. It is of the sandstone—not the grit—formation, and is obtained in the same localities. It comes up in beds of from inch thickness or less, to 12 ins. and more. Sometimes stones 20 ft. long by 8 or 10 ins. may be got. This stone is in distinct laminae, separated by substances of a different nature, dark coloured, and sometimes by scales of a shining substance (mica?). If the flags are much subject to "wet and dry" the upper laminae separates in course of time, and the stone thus gradually becomes rotten. If the landings or flags are set on edge, the wet penetrates between the laminae and the stone splits. If they are laid horizontally with the edges exposed they wear into channels, the hard substance between the laminae remaining, while the sandstone decays. It has been used for mouldings, and also for walls of houses. It decays more or less quickly by "channelling" in either case. The "bed" is sometimes very level, and covered with a substance from the appearance of which the bed is called a "mustard" bed or "pace". Generally it is not so level, and without the peculiar surface, and then it is called a "slape" bed. The flags and landings are used "self-faced", "tooled", and "cleansed" (rubbed). A "mustard" bed is often so level as to require no preparation for rubbing. The self-faced flags can scarcely be laid without inequalities in the surface, and the quarry tooled flags are sometimes not properly taken "out of winding", so that they too have inequalities where water lodges. Inequalities between one flag and another—not upon their own surface. The Bradford flags and landings are the hardest. *Ragstone* used for foundations, is got in the Sandstone quarries. It is like Delph stone shaken into irregularity and confusion of laminae. Its surface scaly and "bumpy". For ordinary house walls 5 to 6 ins. thick may suffice, but heavy walls must be 8 and 10 ins. thick. *Sandstone* is worked with fire-sharpened tools, and one day's work requires about twenty tools; when blunted for Sandstone they are just in a fit condition to work the *grit* stone. In both the *Sandstone* and *Gritstone*, "sandholes" occur here and there of various sizes; one in a gritstone was found 12 ins. by 8 ins., the sand in it was like the stone colour, and towards the outside a reddish brown; this sort of fault is called a "horse". Nodules of ironstone occur in the beds of sandstone, sometimes of several feet diameter. In their neighbourhood the stone is spoiled, loose (splintered?), and discoloured. The seams between the posts of stone are sometimes empty, at other times filled with fine red clay. In such case

the stone next the seam is discoloured in streaks of red colour, which, however, "dries out". "Laces", or cracks, occur in the sandstone as well as gritstone. *Craw* bed is the upper bed in Delph stone quarries. *Caillard* is a very hard stone used in some parts for building. *Magnesium limestone*. At Brauham it is not good, having alum-holes. About a mile and a half from Tadcaster are good quarries. There are now quarries at Morley. Huddlestons quarries are the best in the neighbourhood of Leeds. *Queen's head stone*, from between Bradford and Halifax is a very hard stone but coarse, so that it can scarcely be worked to a good face except on the *bed*; it is used as a building stone with the bed out, and is full of black specks. Gomersall church is built of it (in 1850).

W. R. C.

The sandstones from the lower coalfield in the neighbourhood of HALIFAX and HUDDENSFIELD are much used in Manchester, owing to their good colour and free working qualities. Many of the buildings show symptoms of decay, especially in the places where long pieces have been required, and in moldings and ornamental work. The sulphuric acid in the atmosphere has acted on the clay in these stones, and an impure sulphate of alumina having been formed, it is washed by rain out of the stone and the grains of silica in the latter soon crumble away. In other instances the water percolates down through the beds of the stone placed on its end until it reaches their bases, and then frost and heat force off laminae of stone in addition to supplying acids to act on the stone as above named. The under ledges of coping-stones, although the stone of which they are formed is placed on its proper bedding, often exhibit evidence of decay. This seems to arise from the moisture percolating the stone and finding its way to the lower parts, which, owing to their being shaded from the sun, are nearly always wet, and thus prepared for the action of frost and heat previously alluded to; BINNEY, *Remarks on Building Stones used in Manchester*, in *Builder Journal*, 1860, xviii, 27. Sir Benjamin Heywood's bank, at Manchester, erected 1848, was faced with this stone, carefully laid on its natural bed.

YOTE and YEOT. The leading-in of iron work to stone. A term in use in Gloucestershire and Somersetshire. "The organs at S. Thomas, Oxford * * * * and in other instances are hanging organs; that is to say, the cases are fixed up against the wall by iron bolts YOTED into the stonework"; BARON, *Scudamore Organs*, 8vo., 1858, p. 38. "To mix with water; NARES, *Glossary*."

E. K. R.

YOUNAS (ABDOULLAH BEN), otherwise called Muslimatu ben Abdallah, is said to have presided 936 at the construction of the great alcazar of Zahra (destroyed 1008), in Spain; GIRAULT DE PRANGEY, *Arch. des Arabes, etc.*, 8vo., Paris, 1841, p. 50-4, from CONDE, *Arab Dominion*, 8vo., London, 1854-5; and other writers.

YOUSSEUF ABUL HADJADI. One of the Arab monarchs of Spain 1333-43, who built the alcazar near Malaga, not only at his own expense but from his own plan and under his own directions; CONDE, *Arab Dominion*, 8vo., London, 1854-5.

YOUSSEUF bennâ (the sheikh), i.e., the mason, inscribed on the old mosque at Ispahan; on the college at the entrance of the main street; and his tomb in the suburb of Cheic Sabana. CHARDIN, *Voyages en Perse*, new edit. by Langlès, 8vo., Paris, 1811, viii, 4, 45, 83.

1. 96.

YPEREN (Flem.), YPRES (Engl. and Fr.). A town of Belgium, Western Flanders, situated on the river Yperlee. In ix cent. while only a castle it was destroyed by the Normans, rebuilt 901, walled in 1388, strongly fortified 1688 by Louis XIV; and well built, but unhealthy from the marshes still surrounding it. In 1342 it is said to have had 200,000 inhabitants; but is greatly depopulated. The castle ward (*châtel-lene*) has a richly decorated façade. A lofty house, of Ecuassines stone, dating 1250 is one of the two former Templars' houses. *Illustrations*, Façade, pl. 46 (128), is a rich example of

houses in Belgium and French Flanders during xvi and xvii cents.; the basement is of stone, upper part including the decorations are of brick: it is dated 1544, and is also given in GAILHABAUD, *Arch. du Vme. Siècle*, fol. Paris, 1852, iii, pl. 20. A renaissance building adjoining the hall was designed 1575 by Jan Sporeman; BRITISH ARCHITECT *Journal*, 1884, xxii, 31. The musée contains drawings by Bohm of the best of the "hundreds of timber houses removed of late years". The large (former) cloth hall still remains; the first stone of the high square tower with belfry was laid 1 March 1201; the left wing finished 1230, the right or new hall 1285-1304, and back part 1342; the statues of the façade 1513 were destroyed 13 Dec. 1792. It is a trapezium in shape with two courts in rear. The south façade is 484 ft. Ypres, and 50 ft. high (462 ft. x 50 ft.; and 450 ft.; 436 ft. 8 ins.; or 600-700 ft. and 40 ft. wide). The ground floor was one great hall, and as now subdivided some rooms measure 164 ft. by 98 ft. 6 ins. A wing is now used as the hôtel de ville, and other parts by public establishments. It was restored 1860. A view in PENNY MAGAZINE, 1833, ii, 448. SCOTT, *Lectures*, 8vo., 1879, i, 262, showing it as if Sporeman's building were removed.

The church, formerly the cathedral, of S. Martin (Gothic) 1221-70, is one of the most remarkable religious edifices in Belgium; the west tower, dating from 1434 is 188 ft. 6 ins. high, by M. Utenhove of Malines; the spire is incomplete: 1623 the chapelle du S. Sacrement; 1685 altar of Carrara marble; a finely carved pulpit; many tombs, one of which is a curiously designed brass 1489 and 1487 of P. Lansame and his wife, in the chapel of S. Marie, given in GREENY, *Monumental Brasses*, fol., 1884, p. 46. S. Pierre, xiv and xv cents.; body of brick 250 ft. long and 90 ft. wide; tower xi cent., transition Norman. S. Jacques the greater; xii and xv cent. and fine work; the largest: and S. Nicolas. The *boucherie* xiii cent. given in GAILHABAUD, *idem*, iii, 2 plates. SANDERUS, *Flandria illustrata*, fol., Amst., 1641-4. WAUTERS, *Les Délices, etc., de la Belgique*, 8vo., Brux., 1846, p. 223-6. STAPPAERTS, *La Belgique Mont.*, 8vo., Brux., 1844, i, 115. CHANTRELL, *Dom. Buildings of Western Flanders*, in *ROY. INST. OF BRIT. ARCHITECTS, Sessional Papers*, 1855-6, p. 148. DIERICK, *Ouvrages concernant l'histoire d'Ypres*, 8vo., Ypres, 1878.

14. 50. 96.

YPSAMBUL. See ABOO-SIMBEL, in Egypt.

YRON, or iron, so printed in a black-letter book of 1596. Also "iran" is an old orthography.

19.

YTASSE (...). See ITASSE (...).

YUCATAN. A republic in the Mexican isthmus of America. MERIDA is the capital. TUSAPAN. ECCLESIOLOGIST *Journal*, 1849, ix, 185. FREEMAN, *Hist. of Architecture*, 8vo., 1849, p. 45. WALDECK, *Voyage, etc.*, fol., Paris, 1838, chap. 9-12. STEPHENS, *Incidents of Travels in Central America, etc.*, fol., New York, 1841, 1843; and revised by CATHERWOOD, 1854. NORMAN, *Rambles in Yucatan*, 8vo., New York, 1843. FERGUSON, *History of Arch.*, 8vo., 1867, ii. ATHENÆUM *Journal*, 4to., 1843, p. 277; and 1854, p. 613. FANCOURT, *History of Yucatan, to close of XVII cent.*, 8vo., 1854. ENCYCLOPÆDIA BRITANNICA, 9th edit., 1889.

14.

YUDE. A name for dark blue; SURTEES SOCIETY, *Fabric Rolls of York Cath.*, 8vo., Durham, 1859, p. 359.

YUEN-MING-YUEN, the emperor of China's summer palace and gardens at Hai-teen, near PEKIN; *Detached Essay*, "Chinese Architecture," p. 9.

YUVARA (FILIPPO). See JUVARA (F.).

YVES, count de Bellême and de Alençon, bishop of Seez, about the middle of xi cent. rebuilt his cathedral as directed by pope Leo IX (1049-54); LANCE, *Dict. des Arch. Franç.*, 8vo., 1872. HAWKINS, *Gothic Architecture*, 8vo., 1813, p. 98.

3.

YVES, the sixty-second bishop of Chartres, from 1090, and died 1115; is considered an architect of his church, the first *jube* being attributed to him; LANCE, *Dict.*, 1872.

THE DICTIONARY OF ARCHITECTURE.

ZAGH

ZAARA. See ZARA, in Dalmatia.

ZABALO (JUAN). See ECLAVE Y ZABALA (J.).

ZABOR, in Bohemia. The church, Byzantine in style, is the only specimen of round arch architecture existing in that realm, and was almost unknown until ... Wocel described it 1846 in the *Transactions* of the Royal Society of Prague; BUILDER *Journal*, 1847, v, 149.

ZACCAGNA (GIOVAN' FRANCESCO), of Parma, where 1510 he designed the interior of the church of the Benedictine monastery of S. Giovanni, which has been attributed to Bramante; the exterior is a century later: and about 1521 the madonna della steccata, transition to Italian. He is the Bernardino de' Zaccagni detto da Torchiera, on the authority of the archives of the church; cited by STARKE, *Travels in Europe*, 8vo., 1839, p. 48. 28.

ZACCO or ZACCHO. "The lower part of the pedestal of a column." See ZOCCO. 4.

ZACHARIE DE CELERS, 1551 rebuilt the *halles* at Amiens, after their destruction by fire; GOZE, *Rues d'Amiens*, 12mo., 1854-6. LANGE, *Diet. Biog. Franç.*, 8vo., 1872.

ZACHAROV, Zacharof, Zakharov, Zucharov. A native of Russia; practised at S. Petersburg, where 1799 he designed the academy of sciences (Ionic); 1801 the new buildings of the admiralty, with the dockyards; the regimental barracks of Ismailovski; the new church (cathedral of S. Andrew), with the sail factory at Cronstadt; and a laboratory on the isle des canoniers. His pupils were Martoss jun., Melkiov, and Kalashnikov, who were appointed academicians during their stay at Rome. *Académie*, *Annals* of the Academy of S. Petersburg, p. 38. SVININ, *Descr. de S. P.*, 4to., S. Pet., 1816-28, ii, 87; iv, 135. GRANVILLE, *Guide to S. Petersb.*, 8vo., 1835, ii, 62.

ZACOMA (PEDRO); in 1368 the chapter of the church of S. Felice, at Gerona, entered into a contract with him to erect the campanile; in 1374 (and 1385) the church was fortified, for which the newly erected cloisters were pulled down; and the steeple completed 1392. P. Comas was maestro mayor 1385; Zacoma acting down to 1376. STREET, *Gothic Arch.*, 8vo., 1865, p. 333.

ZAFFRE, Zaffer, or Saffre. An enamel blue. The residue of cobalt after it is freed from arsenic, sulphur, etc., by calcination. COBALT, BISMUTH, ENAMEL, SMALT.

ZAGAZIG. See TEL BASTA, near Cairo, in Egypt.

ZAGHOUAN. A town situated on the northern slopes of the mountain of that name, two days' journey south of Carthage, in Tunisia, and is built on the site and with the materials of a Roman town. That portion of the aqueduct extending to

ZAMB

Djougar, a distance of twenty miles, was probably the work of the emperor Severus. For a great part it is subterranean; the arched portion is 60 or 70 ft. high, and 120 ft. in parts. Under a spur of the mountain is the remarkable ruin of a small temple, placed in the centre of the arc of a semicircular colonnade—designed with much care—its width is 15 ft.; the entire paved area in front 94 ft. wide and 86 ft. long. The spring flowed under this area into a basin of the form of a double horse-shoe to which there was access by a flight of steps at either end. GRAHAM, *Remains of Occupation, etc.*, in ROY. INST. OF BRIT. ARCHITECTS, *Transactions*, 1886, p. 159-164; and *Tunisia*, 8vo., 1887, p. 39.

ZAGRAB. See AGRAM in Hungary.

ZAGURI (PIETRO). Before 1819 commenced the interior of the church of S. Maurizio, at Venice; the façade was carried on by G. A. Selva, and completed by A. Diedo. SELVATICO, *Venezia*, 8vo., 1847, p. 472.

ZAHN (WILHELM), also a painter, of Cassel, where he studied at the academy; went to Italy; and published *Wandgemälde in Pompeii*, 40 pl., fol., Munich, 1823; he returned to Cassel in 1827, and was associated with F. Muller and von Rhoden in the decoration of the new electoral palace. He returned to Italy, and then published the first volume of *Die Schönsten Ornamente und Merkwürdigsten Gemälde aus Pompeii, Herculaneum, und Stabiae*, fol., Berlin, 1828-29; three series, 250 pl., 1829-53; 1828-59. *Ornamente aller Klassischen Kunstepochen*, 100 pl., fol., Berlin, 1830; 1845-8, 3rd edit. 1870. In 1836 he discovered at Pompeii some rare silver vessels and coins of the Cæsars; and 1837 the remains of the town of Teglana, near Naples; in 1840 returned to Germany; became professor at Berlin; published *Auserlesene Verzierungen*; drawing-book for schools, 5 parts, 4to., Berlin, 1842-44, and died in 1871. 68.

ZAHRA. A wonderful alcazar erected 936, near CORDOBA, in Spain. See AZAHRA, and its architect A. BEN YOUNAS. DALY, *Revue Générale*, 1849, viii, 122. 1.

ZAHUBE (EL MAESTRE VICENTE), designed 1571 the tower of the parish church of Guetaria, in Guipuzcoa. 66.

ZALDUA (PEDRO DE), 1607 assessed (*taso*) the design by M. de Aramburu, for the casa de ayuntamiento, and for the church and monastery of the monks of Renteria, in Guipuzcoa; 1610 designed and directed the pulpit of the church of Sta. Maria, at S. Sebastian; and the palace of don Juan de Manicador in a *prado*, near to Zuranz. 66.

ZALDUA (JUAN DE), 1689 with J. de Aranzeta, designed the casa del ayuntamiento at Plasencia, in Guipuzcoa. 66.

ZAMBERLAN (FRANCESCO), born 1529, at Bassano; was

consulted as an engineer on the town hall at Brescia; 1577 at the ducal palace at Venice; and 1588 on a design for the bridge of the Rialto. In 1599 he invented a concrete (*calcestruzzo*) of chalk and pebbles first used for the construction of the Palmanova fortress in Friuli; and was appreciated for his hydraulic works. He died about 1603. MAGRINI, *Arch. e Scult. Bass.*, . . . MAGRINI, *Ponte*, Svo., Ven., 1854, p. 26. ZAMBONI, *Memorie di Brescia*, fol. Br., 1776-88, p. 86, 144, 147. CADORIN, *Pavimenti di Architetti*, Svo., Venice, 1858, p. 90-5. 68.

ZAMODIA (HEINRICH), also called Gamodia, Gnuenden, Gemunden. See AHRLEH (H.), or Arler.

ZAMORA (Anc. AMALLOBRICA). The capital of the province of the same name in Old Castile, in Spain, situated on the river Douro, over which is a bridge, *cir.* XIII cent., of seventeen pointed arches with a gate tower near either end (STREET). In the remains of the walls are seven or eight gates; several curious Moorish watch towers are around the town, which has been of great military importance from early ages. It was sacked by the French after Coruña. It is the see of a bishop; the first, Bernard a Frenchman died 1149. The small cathedral dedicated to the Transfiguration, was begun by Bernard and finished 1174; a round arched doorway to the south transept exhibits singular early work, otherwise the building is chiefly transitional with some late Flamboyant additions. The nave is only 23 ft. wide. A pentagonal east apse. A central dome on pendentives is interesting. The *coro* dates 1490; the stalls not early but fine with good backs to the *subsellar* or *misereres*; the high altar has four columns of broccatello di Spagna; there are two iron pulpits. A large and fine Romanesque west steeple, perhaps the finest in Spain, dates *cir.* 1125-74. The cloisters burnt 1591, were rebuilt 1621 (Doric order). There are now sixteen (twenty or twenty-two) parish churches. La Magdalena, XII cent. belonged to the Knights Templars and 1312 to those of S. John; a rich Romanesque south doorway has a round window over it like that of the Temple in London. Chancel and nave are transitional. A canopied tomb *cir.* early XIII cent., of a knight in bed (STREET) is peculiar work. Sta. Maria de Horta; small, Romanesque like the former; windows high up; square tower of three stages. S. Leonardo; good west Romanesque doorway; a north-west tower with broach spire. Sta. Maria la Nueva; Romanesque; font a large cylinder; campanile modern. S. Juan de la puerta nueva; Flamboyant; square east end; one span vault of 60 ft. S. Pedro y Ildelfonso; nave and aisles thrown into one vault during Flamboyant period; west entrance arched over like that of S. Esteban at Salamanca, above which is the *coro*. S. Isidoro. S. Miguel. S. Vincente; fine Romanesque west doorway of four orders; and a tall late Romanesque tower; the church early Pointed; interior modern. An episcopal palace having corridors and open gallery; palace of Urraca; hospicio, fine XVI cent. work with a good *patio*; a hospital for 300 patients with painted porch 1526; a museum and picture gallery. VILLA AMIL AND ESCOSURA, *L'Espagne Artistique*, fol., Paris, 1842-59, shows La Magdalena, the cathedral; and the plaza de los Momos, with a house having a good façade; *ECCLESIOLOGIST Journal*, Svo., 1853, xiv, 361-5. STREET, *Gothic Architecture in Spain*, Svo., 1865, p. 92-101. CAYEDA, *Ensayo Histórico—de Arquitectura—en España*, Svo., Madrid, 1848; and transl. *Ges. der Baukunst in Spanien*, Svo., Stutt., 1858. C. FERNANDEZ DURO, *Memorias Hist. de la Ciudad de Zamora*, Svo., Madrid, 1882, etc. 14. 28. 50. 66. 96.

ZAMPIERI (DOMENICO), called il Domenichino, and Dom. il Zampieri, also a painter of high merit, a pupil of the Carracci, born 1581 or 1582 (not 1551), at Bologna. He designed the casino of the villa Ludovici at Rome; about 1598 the greater part of the villa Aldobrandini, or the Belvedere, at Frascati, with G. della Porta (PERCIER ET FONTAINE, *Plus Célèbres Maisons—de Rome*, fol., Paris, 1824, pl. 64-6); and the church of S. Ignazio of the collegio Romano (LET., 372, pl. 173; RUBEIS, *Insignium Romanorum Templorum Prospectus*, fol., Rome, 1684, pl. 26-8), for which he had previously made two designs, combined by the

Jesuit Orazio Grassi; on Zampieri refusing to design the façade, the work was transferred to A. Algardi; but PASSERI does not mention this building. Also the richly divided ceiling, and the high altar in the church of Sta. Maria in Trastevere, with the chapel of the Madonna di Strada Capua therein. The chapel of the treasury at Naples. The great Ionic doorway to the palazzo Lancellotti, via de' Coronari (LET., 707, pl. 346), this palace was by F. de Volterra and C. Maderno. Under pope Gregory XV (1621-23) he had the care of the apostolic palaces and buildings. He died 1641 (not 1648), aged 59, at Naples, leaving property of 20,000 crowns besides effects. BELLORI, *Vite*, 4to., Rome, 1672, p. 289. TITI, *Annales—de Rome*, 12mo., Rome, 1686, p. 36, 62, 142-4. DE PILES, *Art of Painting*, Svo., 1754, 3rd edit., 204. QUATREMÈRE DE QUINCY, *Vie des Architectes*, Svo., 1830, ii, 356. LETAROUILLY, *Edifices de Rome Moderne*, text 4to., fol., Paris, 1840-50. 3. 5. 25. 31. 33. 105. ZANALE (BENEDETTO). See ZENALE (B.).

ZANFRAGNINO; properly SCARPAGNI (ANTONIO), called dello Lo Scarpagnino.

ZANINI (GIOSEFFE VIOLA), of Padua, also called Joseph Viala, perhaps in error, by MAUCH, *Architek. Ordnungen*, 4to., Berlin, 7th edit., 1875, pl. t. vii. He designed the palazzo Cumano in Sealona; ROSSETTI, *Padova*, 12mo., 1780, p. 339-40. Published *Della Architettura . . . della Simmetria, etc.*, Libri due, 4to., Padua, 1629; another edition, *Aggiuntovi, etc.*, Svo., Pad., 1678. FRÉARD DE CHAMBRAY, *Parallèle de l'Arch.*, fol., 1650. He adopted the Ionic base of Vignola, reprobated by MILIZIA, *Lives*, trans. by Cresy, Svo., 1826, ii, 108. 3.

ZANOJA (GIUSEPPE), of Milan, was from 15 April 1806 engaged as *architetto onorario* at the duomo, where the gable and upper range of windows of the front, as well as many of the buttresses and pinnacles, were erected by G. Pollak, C. Amati, and P. Pestagalli 1806-13. He designed 1810-12 the porta nuova, and other edifices in the city. He died 16th Oct. 1817, at Omegna. ANTARIA, *Descr. de la Cath.*, Svo., Milan, 1823, p. 35. 27.

ZANT (GIOVANNI VAN), also Giovanni VANSANZIO, and il Fiamingo. See SANTEN (JAN VAN).

ZANTH (LUDWIG VON), born about 1798 at Breslau, in Silesia, as supposed; educated at Cassel and Paris; learnt architecture at Stuttgart under R. F. H. Fischer; about 1810 under Hittorff at Paris, became his assistant, and 1823 went to Sicily with him; and together published *Architettura Antica de la Sicilia*, fol., 1825, Paris, or 1825-35; and *Architettura Moderna de la Sicilia, etc.*, fol., Paris, 1835, 75 pl. Zanth was especially interested in the structures at Monreale and Palermo. In 1830 he returned to Stuttgart from Paris where he designed many town and country houses, and the king of Wurtemberg employed him to design a theatre for Cannstadt (an engraving is in the library of the Roy. Inst. of Brit. Architects); and about 1838 began the drawings for a royal pavilion in a Moresque style, the Wilhelma, in the park of Rosenstein, near Cannstadt; he thereon visited England to study iron construction and heating. He published *La Wilhelma; Villa Mauresque de la Roi de W.*, fol., Paris, 1855, with 10 chromo plates; DALY, *Revue Générale*, 1860, xviii, 230. In 1845 he became *hof baumeister* of Wurtemberg; and 1845-6 redecored the theatre or opera-house by L. P. Guepiere (?) at Stuttgart. For a wealthy landed proprietor in Hungary he made plans for a large village, houses and farms of various sizes, a church, and other public buildings in connection with the restored castle of the owner. He visited Italy 1856 with Hittorff and family for his health; prepared the drawings for a protestant church for the king his patron, which he presented and it was to have been carried out; and also made drawings for a Roman Catholic church (one was designed by J. von Egle). He died 7 Oct. 1857. He received many decorations. C. HITTORFF edited *Architettura Antica de la Sicilia; Recueil des Mons. de Ségeste et de Salinonte*, fol., Paris, 1870, 4to. text, by Hittorff and Zanth. DONALDSON, *Memoir*, at Roy. Inst. of Brit. Architects, 1857-8, p. 115 (1853-4, p. 31);

-reprinted in *BUILDER Journal*, xv, 666-7; and *BUILDING NEWS Journal*, iii, 1221.

ZANZIBAR, called Unguja or Beled-Zanzibar, in the island of the same name in Central Africa, and the capital of Eastern Africa. The residence of the sultan of Muscat; the palace or castle, called the 'harem', 300 ft. long, has four turrets; the eight or ten mosques are whitewashed buildings. The town has a long front of square white stone houses, with others of stud and mud and thatched. The cathedral or Christ church, was commenced in 1874 by C. F. Hayward, F.S.A., of London, but not opened until Dec. 1880; it is built on the site of the old slave market, under the personal attention of bishop Steere to whom the general plan and arrangements are to be attributed, by native workmen and with some local materials, being a sort of concrete of coral stone, local mortar, and some Portland cement, even to the pointed vault, and is a success acoustically. A movable centreing was sent out from England, also Devonshire marble pillars, stained glass, marble table, the font, a cross of Doulton ware for the apex of the apse roof, etc. The primitive arrangement of the presbytery at Torcello has been followed. The interior dimensions of the edifice are, length 88 ft. to apse which is 25 ft. 6 ins. deep; width 38 ft. between the walls over which is a pointed vault 28 ft. wide, this is carried on piers with coupled columns of Devonshire marble (making the clear width of about 26 ft.); height 45 ft. to spring of vault which is 15 ft. 6 ins. high. The windows are very narrow and tall. The turret 90 ft. high to the spire which is about 27 ft. The campanile contains a clock, and a set of carillons 1882 by Warner and Co. *BUILDING NEWS Journal*, 1875-6; and 1881, xli, 358; *BUILDER Journal*, 1881, May 28, p. 666; and *BRITISH ARCHITECT Journal*, 1882, Oct., describing the stained glass of a west window 15 ft. diameter. Uzi or Uguja-neu or Great Uguja, a town in the south-west side of the island, has a stone mosque. It is peopled by the Mubalivo, the tribe who ruled the island before the invaders arrived. From Zanzibar is obtained the gum Anime, considered to be the very best of the hard gums or semihossil resins commercially known as copal, and used for varnish. 50.

ZANZIO. See SANTEN (JAN VAN).

ZARA (Anc. Kotar; Iadera, Talaria; mod. Gr. Diodoron). The capital of Dalmatia, situated on an island having Venetian walls. In the centre of the sea-front is the porta di S. Grisogono or Crisogona, Venetian on the outside, and Roman on the inner, said to have been brought from Etna (CASSAS, *Voyage de l'Istrie*, fol., Paris, 1802, p. 83, 184-9); this opens in the principal street, at the other end of which is the porta di Terrafirma, 1543 (Doric), by M. San Michele (pl. 134 of his works). A good *broletto* or loggia of a few years' later date. Of the two columns, one of the Corinthian order is supposed to be the last fragment of a Roman temple; the other one is fluted. There are remains of an aqueduct outside the town; and five fountains near the governor's house, or wells for storing rain-water, said to be by M. San Michele, deserve attention. The town is the seat of an archbishop. The cathedral, dedicated to S. Anastasia, vedova and martyr, of Lombard style 1192-1204; 1202- consec. 1285, in the Venetian and French (fourth) crusade; the curious (perhaps earlier) crypt is not usually noticed (NEALE and STRANGFORD). A ciborium 1322 at its west end; white marble triforium to the nave; west façade covered with arcaded work, two good round windows and three deeply-recessed doorways. The massy unfinished campanile 1496, is proposed to be completed, a design by T. G. Jackson of London, appeared in the *BUILDER Journal* of May 25, 1889, and a design approved by the Austrian Government in 1891, lx, 392. Adjoining this is the round church of S. Donato, *cir.* 900 with three apses (HUBSCH, *Altchristlichen*, fol., 1858, etc., p. 22, pl. 3, fig. 19; and JACKSON, *Architecture of Dalmatia*, in *ROY. INST. OF BRIT. ARCHITECTS, Transactions*, 1886-7, p. 167-77. Remains of S. Orsola, round, with five apses. The small church of S. Vitus. S. Simeone, renaissance, retains behind the altar the silver shrine

1377-80 by F. da Milano, given by Elizabeth of Hungary. S. Grisogono, or Chrysogonus, *cir.* ix cent. with three apses; west front 1407; tower 1105. Greek church of S. Elias. Benedictine nunnery of Sta. Maria, its tower to the north was completed 1105. S. Pietro Vecchio. S. Domenico. S. Francesco 1212-82 has good stalls 1375 by G. da Borgo S. Sepolero. A public library the only one in Dalmatia. PETER, *Skizze in Dalm.*, in "Sommers Taschenbuch", 12mo, Prague, 1833-4; *Das Koenigreich Dalmatien*, 4to, 1840; *Dalmatien in seinen versch. Beziehungen darge.*, 8vo., Gotha, 1857. VONBANK, *Arch. delle Chiese di Zara*. GIBBON, *Decline*, etc., 8vo., chap. lx. STRANGFORD, *Eastern Shores of the Adriatic*, 8vo., 1864, p. 264-8. R. H. R., *Rambles in Istria*, 8vo., 1875, p. 77. J. G. WILKINSON, *Dalmatia*, etc., 8vo., 1848, i, 78. NEALE, *Notes on Dalmatia*, etc., 8vo., 1861 p. 115-25; and *ECCLIOLOGIST Journal*, 1861, xxii, 295. FREEMAN, *Neighbour Lands of Venice*, 8vo., 1881, p. 133. HEIDER UND EITELBERGER, *Mittelalterliche Kunstdenkmäler*, etc., fol., Stuttgart, 1856-60. 14. 28. 50. 96.

ZARAGOZA, commonly Saragossa (the Saldua of the Celtiberians; Rom. Caesarea Augusta; Arab. Saracosta). The capital of the province of the same name in Aragon, in Spain, situated on the river Ebro, crossed by a massive stone bridge, 1437, 600 ft. long, of seven arches. The dam in the drain of the river near S. Lazaro was done *cir.* 1780 by A. Sanz. The town is entered by eight gates, besides the four in the walls of Augustus, part of which may be traced. Some very early clay lamps, coins, etc., were discovered 1849 near the quarries by the port (*ARCHITECT Journal*, 1849, i, 520). The *caso* or moat, the great thoroughfare, contains many good specimens of architecture; the houses, Renaissance with Gothic plan and details, are castles, being built of solid masonry with carved ceilings, rafters, cornices, and decorations; and slender belfry-towers of brick; many falling into decay or turned into stores, granaries, and farm buildings. The house of the conde de Argollo, now a school, has a rich wood cornice at the entrance and in the *patio*; zodiac signs in relief in upper story; the casa Zaporta 1550 is of rich cinque-cento work, with a staircase having a rich ceiling with groups of musicians; and a good decorated *patio* (*BUILDING NEWS Journal*, 1858, iv, 697-9). A small statue of Pignatelli was cast 1858. The square citadel with towers at the angles of the Moors, called *La Aljaferia*, was the residence of the kings of Aragon; it was used by Suchet for barracks, later a military hospital, and a prison; it has been thoroughly restored under Alfonso XII (1874), and is now used as barracks; a salon da Sta. Isabel has a beautiful *artesonado* (VILLA AMIL); also an elegant gallery and a rich cornice of vine-leaves, the date of 1492; and a small octagon mosque of the Moors. Aug. Morlaues 1551 carried out the great work of the acequia imperial de Aragon; the drawings 1540 by Gil Morlaues are at Simancas.

The city is the see of an archbishop, created 1318. There are two cathedrals (like Cadiz), each occupied for six months. The earliest one is dedicated to the Saviour, called *La Seo or Seu*; it inclines to the north-east. Some Romanesque work is to be seen in one of the windows and a portion of a buttress; but it was reconstructed after 1119. The earliest portion is at the north-east angle on the exterior, the brickwork for 64 ft. is inlaid with coloured tiles, *cir.* 1350. 1683 the exterior was much modernised. The nave has two aisles on each side, all five being of equal height or nearly so, and the small windows are high up in the walls; the chapels between the buttresses are more or less of interest; the capilla de S. Bernardo, about 1550 is by C. Mendive. The first chapel, used as the parish church, has a splendid Moorish ceiling, a fine tomb, and a statue of Benedict XIII (died 1730) surrounded by figures of knights of various orders, with mourners standing in niches above the tomb. The lantern, *cimborio*, at the crossing has a Gothic dome, is octangular and square on plan; on giving way in 1500 a congress of five architects was held, and it was rebuilt 1505-20 by H. de Egas: it was struck by lightning 7th April 1850 and burnt and the cathedral much injured. The *trascoro* 1526-8,

has twelve columns, canopies, and colossal statues, by Tudelilla of Tarragona. The interior is grand but of late date and style; the jubé and high altar are shown in VILLA AMIL. The tower, octangular and lofty, with Corinthian columns, is drawn into four divisions or stages, 1683-85 by G. B. Contini; who perhaps also restored the capilla del sagrario.

The second cathedral dedicated to the Virgin is called *el Pilar* from its relic. In 1677 F. de Herrera Hinestrosa, as *maestro mayor* of the royal works, was sent by king Charles II to select the site for it; his designs were approved and the foundations begun at once (LLAGUNO): it is stated to have been "improved by Herrera in 1677, and 1753 by V. Rodriguez who rebuilt portions": and 1870 was completed. It is 500 ft. long and 300 ft. wide; and is lighted only by a few windows. The seven domes are covered with coloured tiles; the central one over the *coro*, *cir.* 1780 by A. Sanz, *maestro mayor*, from the design of V. Rodriguez. The *illeria* of the *coro*, 115 elaborate stalls, are a fine Renaissance work 1542 by J. Moreto of Florence. The *reja* 1574 is the masterpiece of Juan Celma. The immense high altar, of alabaster from Escatron, is a masterpiece by D. Morlanes (called Forment) of Valencia. The capilla del Pilar is oval, with sixteen monolith columns of broccatello di Spagna, and other columns, 1753 by don V. Ventura, who left a design for a grand façade for the cathedral, and designed in coloured marbles the *retablo*, the finest in the city, for the capilla de S. Lorenzo. A "votive column", the chief one of the kind; a description appeared in the *Tablet* newspaper of about 15 Oct. 1890.

The church of S. Pablo, early XIII cent. with an apse; or from 1259, has a façade with columns, and a Plateresque high altar, of wood, early XVI cent., by D. Forment, but more likely by a pupil. A fine octagonal brick steeple at the north-west angle is covered with tile-work like that at the first-named cathedral (VILLA AMIL). The church of Santiago; some capitals of the columns of XII cent. are now in the museum. S. Gil Abbot; the tower (BUILDER *Journal*, 1883, xiv, 737). SS. Justo y Pastor, 1497-1507 of three ailes, by P. de Gumiel. Sta. Cruz (Greek cross) *cir.* 1780 by A. Sanz; who outside the city designed the churches at Urrea (elliptical), and at Binaces, both for the duque di Híjar; that of Epila, the façade of which with an attic and two towers was added by his son don Matias Sanz; renewed the round church of Pueblo de Híjar with a cupola, and others, as named *s. v.* Sanz. The Hieronymite monastery of Sta. Engracia 1476-1517 designed by P. de Gumiel, is of rich Gothic; Juan, and Damian or Diego Morlanes, sculptors of Valencia, the former worked at the monastery for Ferdinand VI (1476-1516). Damian gave the plan; others say they both designed the façade of the church 60 ft. long by 105 ft. high; a subterranean chapel, rebuilt after the damage in 1808 by Gironza, has the ailes lined with niches and carved sarcophagi. The cloisters, transitional Gothic or Moresque to Renaissance, date 1536 by Tudelilla of Tarragona (VILLA AMIL, ii, pl. 45). The Carthusian monastery of Aula Dei, founded 1563 by don H. de Aragon, who employed M. Martin de MITECAR, sup. of the works, having inspected and made plans of the monasteries of Valencia; while M. Miguel de Riglos, deputy master of the works inspected those of Catalonia. The Carmelite monastery was pulled down 1858. The monastery of S. Francisco 1286-1360, with a church of one span.

The vast archiepiscopal palace was gutted and plundered by the French. The town house, a massive edifice of brick, has an upper story consisting of a series of arches and piers with double-headed arched windows in each. La casa de la diputación is similar in design. The remains of the parliament house 1437-40, which was also destroyed by the French. The old ayuntamiento, the former palace of the kings of Aragon, has a fine Gothic saloon or *lonja* with a lofty ceiling supported by 24 columns in two rows. The design and execution of the *torre nueva*, 1504 built in fifteen months, was by Gabriel Gombao, with Juan Sariñena, the jew Ince de Gali, and the moors

Ezmel Ballabar and Momferriz. The footings are 56 ft. below the pavement; it is an octagon of 45 ft. across and rises plumb for about 9 ft.; in the next 100 ft. it inclines 8 ft. 9 ins. to the south; the rest is plumb, (it is stated to incline about 9 or 10 ft.). It was at first 275 ft. high, but in 1749 was made 295 ft. to the top of all; the steps between the two walls is 4 ft. 8 ins. wide; the walls are of diapered brickwork, (a Spanish foot is = 11.04 Engl. inches). It has been restored. LOCKER, *Views in Spain*, 1824. STREET, *Brickwork in the Middle Ages*, in CHURCH BUILDER *Journal*, 1866, p. 28-32, with cut of the upper portion. The *lonja* or exchange, 1541-51, square, of brick, turrets covered with green and white tiles, fine projecting cornice with medallion heads; a large hall and good interior. La casa de la misericordia, hospital or poor-house, 1476-1516, for 700 to 800 persons. New wing of the infirmary for convalescents, *cir.* 1780 by A. Sanz. A new general hospital, one of the largest in Spain, the former one having been burnt. The university of 1474 was burnt, a new quadrangular one was begun before 1840, for 1,500 students. College of S. Ildefonso, commenced 14 March 1498 by P. de Gumiel; the façade 1541-53 by R. Gil de Ontañon. The casa de las infantas del Pilar, *cir.* 1780 by A. Sanz, is now the *liceo* (VILLA AMIL). *Museo nacional* in the former convent of Sta. Fé. There are also a seminario, theatre, baths, and a bull-ring.

STREET, *Gothic Architecture in Spain*, 8vo., 1865, p. 369-75. WARING AND MACQUOID, *Examples of Architectural Art*, 63 pl., fol., 1850. LOPEZ, *Tropheos y Antigüedades de la Imp. Ciudad de Zar.*, 4to., 1639. VILLA AMIL ET ESCOSURA, *España Artística*, etc., fol., Paris, 1842-50. ARRUEGO, *Catedra Epis. de Zaragoza*, fol., Zar., 1653. MACQUOID, in BUILDING NEWS *Journal*, 1858, iv, 697-9. WARING, *Notes of an Architect in Spain*, BUILDER *Journal*, 1851, ix, 733. *The Two Cathedrals*, in ARCHITECT *Journal*, 1849, i, 407, from the ATHENÆUM *Journal*. D. DE ESPÉS, MS. history on the ecclesiastical history of Z. PENNY MAGAZINE, 1845, xiv, 353. 14. 28. 50 66 96.

ZAROUIM, in Tunisia. A fine triumphal arch, the only monument erect, and almost intact; BOESWILLWALD, *Report to the French government*; printed in ROY. INST. OF BRIT. ARCHITECTS, *Journal of Proceedings*, 1887, p. 124.

ZARSKOE-SELO or Tzarskoe-selo, *i.e.*, imperial spot. See PETERSBURG (SAINT), at end.

ZAWADZKI (STANISLAO), cavaliere; a Pole, was premiated at the academy of S. Luca at Rome, *temp.* 1764. He designed several barracks especially for artillery; and was a colonel of engineers. CIAMPI, *Notizie di—Archit.*, 8vo., Lucca, 1830, p. 116.

ZAX or SAINE. The short term for a "slater's axe", or ripper, chopper, or handpick as formerly called. It was originally only a heavy blade of iron, no pick to it. It is used for cutting off the heads of nails in reslating and repairing; also for trimming slates, and making the two holes by a gauge, before slating. 1.

ZAYI, near Uxmal, in Yucatan. The principal ruin is an immense pile facing south; the front wall 20 ft. high shows the remains of rooms and ceilings, and is about 268 ft. long by 116 ft. wide. Above it is the main building with a portion of the steps leading to the top; on this again is another building with steps, of hewn stone without ornament; the work more resembles that of Kalibah than of Chi-Chen. STEPHEN, *Yucatan*, fol., 1854, ii, 21. NORMAN, *Rambles*, 8vo., New York, 1843, p. 149-53. DAILY *Review Générale*, 1849, viii, 364.

ZEALAND; NEW. See WELLINGTON, the capital.

ZEBRA WOOD; Omphalobium Lambertii; Guettarda speciosa. A native of the Brazils and Rio Janeiro, in West Indies, from whence it is sent in small planks of about 24 ins. The colour is an orange brown intermediate between mahogany and rosewood generally in straight stripes. It is much valued for the finer sorts of cabinet work, and in turnery. PIGEON WOOD is usually lighter in colour and of more yellow browns. Tortoise wood is probably a variety of the same species. AMBOINA. HOLTZAPFEL, *Catalogue of Woods*, 8vo., 1843, p. 110. 71.

ZEHNTER (HEINRICH DER), 1380 was *werkmeister* at the dom at REGENSBURG, succeeding A. Egl. POPP AND BULAU, *Les Trois Ages*, fol., Paris, 1841. 92.

ZEHRA, the palace; see ZAHRA, in Spain.

ZEITZ (MICHEL JOEHER, dit de), 1550 was master of the works at Strassburg, when he succeeded to Jean Spiegel. SCHNÉEGANS, *Maître des Œuvres de Stras.*, in DIDRON, *Annales Archéologiques*, 4to., Paris, 1848, viii, 147. LANCE, *Dict. Biog. des Arch. Franç.*, 8vo., Paris, 1872.

ZELANZ. Another name for KLAGENFURT, in Illyria.

ZENALE (BERNARDINO) da Trevio or Trivigi, or Bernardo da Treviglio, also a painter, a pupil of V. Civerchio, and an engineer; 1500-19 carried on the works at the duomo at Milan, and designed buildings which are not named. He wrote a treatise "on the Laws of Perspective, and the proportions of the Human Form", completed in 1524. He died in 1526, aged 90. VASARI, *Lives*, edit. 1851, ii, 429; iv, 541. QUATREMÈRE DE QUINCY, *Vies*, 8vo., Paris, 1830, i, 106. GWILT, *Encyc.*, edit. 1888, p. 138, § 335. PASSAVANT, *Geschichte, Kunstblatt* for 1838, p. 266. Bernardino Buttinone da Trevio, at Milan (died 1520, NACLER), is apparently the same person. 5. 27. 68.

ZENELEY (HENRICUS DE). See YEVELE (H. DE).

ZENGA (HIERONYMUS), i.e., Girolamo GENGA, executed the scenery for Francesco Maria, duke of Albano or Urbino; SERLIO, *Architettura*, fol., Ven., 1663, p. 81, and 239, who praises his work, and his reservoir at Colle imperiale.

ZENGG, Senga or Szeny (Lat. Segnia). The seat of a bishopric near Fiume, in Dalmatia; a royal free town; there are two fairly well built squares, several good houses; and a cathedral, dedicated to the Assumption of the Virgin. An old ruined Venetian castle of Nelaj outside, is finely built with vedettes at its angles on corbels. STRANGFORD, *Eastern Shores of the Adriatic*, 8vo., 1864, p. 272. 26. 28. 50.

ZENNOR GRANITE. The same as Penrhyn or Penryn granite. See GRANITE (p. 71, etc.).

ZENO or **ZENON**, son of Theodorus, was architect of the city works at Aspendus, and designed the theatre there, and according to an inscription he was rewarded by a statue therein, "trois milles deniers", and a garden near the hippodrome, according to *TEXIER, Asie Mineure*, fol., Paris, 1839-49, iii, 218, 244; and 8vo., 1835, p. 718-22; and DONALDSON, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1868-9, p. 225. At Aphrodisias was a school of distinguished sculptors of this name, in the time of Trajan, the Antonines, and their successors (98-cir. 200). THE BUILDING LAWS of the emperor Zeno (474-91), and Justinian (527-65) for private houses in Constantinople. by H. E. DIRKSEN, and HAMILTON, in FALKENER, *Museum of Class. Antiq.*, 8vo., 1851-2, i, 305-52.

ZENOCLES; properly XENOCLES.

ZETA. See DIKTA, where its difficulty is pointed out. An upper story; a watch tower; (or zeticula) a small room; a summer house in a garden; (or zeticula) an audience chamber; a room heated like a stove; a little withdrawing chamber with pipes conveyed along in the walls, to receive from below either the cool air, or the heat of warm water; a stove room. 2. 4. 19.

ZEUGHER (LEONARD), born 1812, at Zurich; built, together with G. A. Wegmann, the spinal theatre. His best work is the schoolhouse at Winterthur; he also designed the church at Neuminster; the new *pfandhaus*, the blind institute, and many private houses at Zurich. 68.

ZEUS of the Greeks; the **JUPITER** of the Romans. To the previous notice it may be added that Sylla removed some Corinthian columns of the temple to Zeus Olympius at Athens, to adorn the temple to Jupiter at Rome, at its rebuilding after the fire of A.U.C. 670; it was dedicated by Q. Lutatius Catulus; marble was substituted for stone and stucco. The temple to Zeus and Hera, the "Olympieion" at Olympia, was of the Doric order; of porous stone stuccoed; 64.10 mètres or nearly 200 olyn. feet; the columns 7 ft. diam. in front; 6½ ft. at sides; the statue by Pheidias. The god wore sometimes a

wreath of olive; the Dodonean Zeus a wreath of oak leaves. BURN, *Rome*, 4to., 1871-6, p. 189-91. NEWTON, *Essays on Art and Archaeology*, 8vo., 1880.

ZEVIÖ (DEL). The family name of FALCONETTO (G. M.), son of Jacopo.

ZHE-HOL, in Tartary. The temple of Poo-ta-la, a corruption of Budhalaya, the habitation of Buddha, is the most spacious, celebrated, and wealthy of all the temples in Tartary. G. WRIGHT, *China, etc.*, 4to., 1843, i, 20, and plate.

ZIEBLAND (GEORG FRIEDRICH), born 1800 at Regensburg, became a pupil at the academy at Munich; being one of Fischer's most talented pupils, he employed him at the building of the theatre there; he also owed much to A. M. Quaglio. In 1827 assisted by royal funds he went to Italy, and king Louis engaged him to decorate the Villa Malta, at Rome, in the Pompeian style. In 1829 he returned to Munich, and received an appointment, and 1831 designed the K. steller cataster commission gebäude (hôtel du conseil des taxes); and the Theresa monument (or monument to king Otho) at Aibling (Gothic), unveiled 1835; 1842-3 the rich bronze baldaquin in the crypt of the princes, in the S. Cajetan church; completed the church of S. Maria Hilf in the Au suburb, begun by Ohlmüller. 12th October 1835 was laid the first stone of his great work the basilica of S. Boniface, on the model of the church of S. Paolo at Rome; it was consecrated 24 November 1850. It is of red brick with white stone dressings; double aisles of great height, clearstory, and apse: 262 Bav. ft. long by 124 ft. wide inside and 78 ft. high. In the nave are 64 monolithic columns of (grizzled) grey Tyrolese marble 20 ft. long; there is a small subterranean chapel; and a convent in the rear. Ziebland carved his initials over the portal and his portrait in the head adjoining; *BUILDER Journal*, 1846, iv, 7; vi, 547; viii, 589. WEBB, *Continental Ecclesiology*, 8vo., 1848, p. 143. CIVIL ENGINEER, ETC., *Journal*, 1839, ii, 426, from PENNY CYCLOPEDIA, s. v. Munich. He made great additions to the palace-castle of Hohenschwangau for duke Maximilian after D. Quaglio and D. J. Ohlmüller; 1843 at Weimar made plans for the restoration of the Wartburg for the grand duke. He died 24 July 1873 at Munich. VAPEIREAU, *Dict. Univ. des Contemp.*, 8vo., Paris, 1858; 5th edit. 1880. 68.

ZIESENIS (BARTHOLOMÆUS WILHELMUS HENDRICUS), born 5 June 1762 (or 1768), at Amsterdam, also a sculptor, was a son of Anton, a sculptor (1731-1801); and became a pupil of van der Hart. He designed the Lutheran church at the Hague; 1814 the decorations of the new church at the inauguration of the king; the farm Elewoud; the enlargement of the château de Broekhuysen; with restoration and enlargement of the palace called the Old Court, at the Hague; was appointed architect to the public works and to the king; and designed many private houses in Amsterdam and the Hague. GOETGHEBUER, *Mons. des Pays Bas*, fol., Ghent, 1827, p. 40, 43, 50, and xii of list. 24.

ZIGZAG (Fr. *bâton rompus*). The same as CHEVRON and DANCETTE. An ornament formed in bands or strings, and in the mouldings of arches of early mediæval architecture; it is not peculiarly Norman (FREEMAN, *Hist. of Arch.*, 8vo., 1849, p. 41-46); is seen more in England than in Normandy; and extended into late Norman work and transition to pointed arches. It is common in the East (CORDEKO, *Italiana Architettura*, 8vo., Brescia, 1829, p. 143). It occurs in the arches from caps of columns in the palace of Diocletian at Spalato; ADAM, *Ruins*, fol., 1762, pl. 15-6, 25, 46; WHITTINGTON, *Eccles. Antiq. of France*, 8vo., 1811, p. 221. The bird's head moulding at the hospital of S. Cross, Hampshire, is a beautiful variation of the mode of filling up the spaces. In some examples the prominent parts of the moulding stand out free from the wall. A bold string to a wall of the tribune of the porch of the abbey church at Vézelay, cir. 1150-60, is formed of chevrons springing from a double roll corbel; shown in VIOLETT-LE-DUC, *Dict. Rais.*, s. v. Balustrade, p. 68; and p. 186. 1. 17. 19. 25.

Water is represented on Egyptian monuments by parallel zigzag lines. This was the earliest and simplest form, and it is seen on the rudest pottery of the flint and bone age. Also on Etruscan and other ancient vases, and around doors in Assyrian architecture, as shown in one of the slabs in the British Museum from the principal hall of the north-west palace at Nimroud. It may be the origin of the zigzag moulding placed over doors, probably as symbolical of the water of baptism; BARLOW, *Symbolism on reference to Art*, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1859-60, p. 106. ORNAMENT (p. 37).

ZIGZAG (Fr. *tranchée*) in fortification; the lines formed in the earth in course of an attack. AIDE MÉMOIRE, 8vo., 1845-52, iii. The line taken in making a carriage road, or railway, up the face of a steep hill, or mountain. 5.

ZIMBABWE, in Mashonaland, in the south-east of Africa. Mysterious ruins have been lately discovered covering an area of several square miles, consisting of temples, obelisks, pyramids, towers, and other large structures, of considerable strength, built of hewn granite blocks about the size of a brick; mortar not being used it is considered to denote great antiquity. They are supposed to be of Moorish origin and illustrative of Phallic worship (BRITISH ARCHITECT *Journal*, Sept. 11, 1891, p. 191) rather than as connected with the land of Ophir, as at first ascribed. ARCHITECT *Journal*, 1890, xlv, 216, from THE TIMES newspaper.

ZINC. The ordinary commercial name is Spelter. This metal was perhaps first mentioned by Paracelsus in XVI cent. under the name of zinetum. The principal ores from which the metal is obtained are, the sulphide of zinc, more familiarly known as *blende*; the carbonate or silicate of zinc, also called CALAMINE, sparry calamine and zinc spar; and the red oxide, or *zinc ore*. Chiefly the sulphuret and carbonate of zinc is obtained by distillation by descent. The ores are found in Cumberland, Derbyshire, Cornwall, Flint, and elsewhere in England, not in a native state; in the Isle of Man zinc ore is called BLACK JACK; it is imported both as calamine from Spain and the United States, and in the metallic state; either crude in cakes, or rolled into sheets, from Germany, Holland, and Belgium. The works of the Vieille Montagne Company are at the village of Chénée, about 2½ miles from Liège, on the railway to Verviers. The works of the Nouvelle Montagne Company are at the village of La Mallieu between 10 and 12 miles from Liège on the railway to Huy. The metals with which zinc is naturally associated, and which tend to destroy its malleability, are iron, lead, arsenic, and sulphur. Impure, commercial, brittle, zinc, if heated to a certain temperature, becomes malleable and remains so even when cool; this is attributed to arsenic or sulphur, which the heat may separate, these being both more volatile than zinc. A small per centage of iron renders most of the spelter, particularly English, unfit to roll; BUILDER *Journal*, 1849, vii, 55-6. It is of a light bluish white, with a brilliant metallic lustre; it slowly tarnishes in the air, but only superficially, the film protecting the metal from further oxidation. Its specific gravity varies from 6.9 to 7.2. Though naturally very brittle, it may easily be rendered quite malleable and ductile, by being subjected to a process of lamination, at a temperature of from 220° to 300° Fahr. One inch thick weighs 37½ lbs. per foot superficial. Its expansion and contraction are greater than those of any other metal. 71.

The invention of laminating zinc practised by Mr. Sylvester of Sheffield, is claimed by the French National Institute for Macquer and Sage, who are said to have done the same thing long before in France; adding that Dony and Poncelet convert calamine, or the oxide of zinc, by simple sublimation, into metal sufficiently pure to be laminable. The ore affords them one third of its weight of zinc, which is much cheaper than lead; ACKERMANN, *Repository of Arts*, 8vo., 1809, ii, 308. A sheet of pure zinc will be of an even colour, without black spots or blotches; will be very ductile, bending readily backwards and forwards in the hand, and will not easily break. If impure it

will be the opposite of all this. If there be any iron in it, it will be worthless; and if lead, it will be but little less so. The sheets are generally from 7 to 8 ft. long by 3 ft. wide, and of various gauges of thickness, from No. 6 to 16; that is from about 0.025 to 0.072 of an inch. The thinnest of these are used for lining packing cases; the next numbers for perforated articles, frets, friezes, and a variety of similar goods. The higher numbers are more particularly employed for sash bars; and for roofing, gutters as No. 13 to 16; No. 14 for 10 ft. lengths; No. 15 for 20 ft.; No. 14 is considered to be ample for London; it must be laid quite free to expand and contract. FISHER, *Rolls in Zinc Work*; B. N. *Journal*, 1866, iii, 207.

Oxidation. Zinc oxidises when first laid, and the coating thus formed is insoluble and protects the metal; but if the sheet be too thin, the oxide penetrates and the metal goes into pin holes on being walked over; sheet zinc is very durable if used of sufficient thickness. Zinc is oxidised to the extent of 130 grains per square foot in twenty-seven years, nearly one half of the oxide thus formed being removed by the moisture of the atmosphere. Dr. Pettenkofer, in ARTIZAN *Journal*, xvi, 97; BUILDER *Journal*, 1858, xvi, 135; BUILDING NEWS *Journal*, iv, 256. The destruction of the zinc is inevitable, as a coating of oxide can never completely protect the subjacent metal from further oxidation; as explained in B. N. J., 1859, vi, 228. The oxide does not scale off as that of iron, but forms a permanent coating on the metal. A smoky atmosphere does not injure good zinc; sulphuric acid in the air, and muriatic acid in sea air, destroy common zinc. At Liège, a roof of zinc 55 years old; and another 30 years, were then perfect. If of best quality it will last from 20 to 30 years; on the contrary, S. Philip's church, Dalston, built 1841, had to be fresh covered about 1858. OXIDATION.

The internal oxidation of steam boilers is to be prevented by having small pieces of zinc plate attached at various points inside the boilers, care being taken to secure perfect metallic contact between the two: also with iron water pipes; BUILDER *Journal*, 1857, xv, 352; but HAYES, *On the Corrosion of Zinc covered or Galvanized Pipes when used for conducting Water*, in the *Boston Medical and Surgical Journal*, and in THE CHEMICAL NEWS, April 5, 1862, urged that the coating did not afford the requisite protection, perhaps to some water, as the zinc became dissolved in it and the salt from both metals was so large as to render it unfit for general domestic use. Copper sheathing should have strips of zinc 8 ins. by 2 ins. screwed on each course of copper, whereby the galvanic influence prevents oxidation of the copper; B. J., 1854, xii, 215.

Corrosion of zinc; cement does not injure it; but lime strongly, calcareous waters, and wood fires destroy it. When placed against bricks containing even 1.14 per cent. of soluble salts, it is destroyed, hence felt or similar material should be placed between them. Oak boarding is bad, and fir boards should be dry, and laid about half an inch apart. Zinc bedded in loam as a "dry course" was found pierced by holes in nine months (BUILDER *Journal*, 1845, vii, 17). There does not appear to be sufficient authority for the statement that the urine of cats is destructive; a No. 9 flat badly laid, in fourteen years had to be renewed, cats could not have got at it. Liquid ammonia oxidises and then dissolves zinc (URE, *Diet. of Chemistry*).

Alloy. Almost all the metals combine with zinc, and some of its alloys are of great importance. BRASS, the most ancient, was used before it was known that zinc existed, in copper and calamine.

English brass is 1 atom of zinc to 1 of copper.

Dutch brass is 1 atom of zinc to 2 of copper.

2 atoms of zinc to 1 of copper is best; Encyclopædia Britannica.

Muntz's yellow metal of Birmingham, sheets for sheathing, 40 per cent. of zinc to 60 of best copper.

BRONZE is composed of copper, zinc, and tin, of which vessels have been found at Nineveh and Herculaneum. ALLOY. COPPER. LATTEN. PLUMBIC ZINC. WETTERSTEDT'S METAL.

Incombustibility It is brittle at ordinary temperatures; between 250° and 300° Fahr. it becomes both ductile and malleable; at 400° it may be reduced to powder; at 773° it fuses; and at a white heat, out of contact with air, it sublimes and is condensed unchanged. The best zinc only ignites on a blazing fire, and never when the flame merely passes over it; it is therefore most useful for roofs especially where the sheets are folded over excluding draughts; it resists the action of flames at 700° Fahr.; lead at 500°. At the great fire at Guadeloupe, the zinc covered houses escaped (B. J., 1849, vii, 56). *Experiments on the Comparative Incombustibility of Zinc, Tiles, and Curton Minéral*, in DALY, *Revue Générale*, 1867, xxv, 163-4.

Painting. Oil colours do not readily adhere to sheet zinc. Prof. Boettger recently published a process for accomplishing it, by a previous application, by means of a hard brush, of a mordant, composed of one part of chloride of copper, one part of nitrate of copper, one part of sal ammonia, and sixty-four parts of water, to which is afterwards added one part of hydrochloric acid. The zinc turns of a deep black immediately after the application, changing after drying (12 to 24 hours) to a dirty black greyish-white shade, upon which any oil colour may then be applied and it will adhere with great tenacity; *Engineering*, 13 Nov. 1868. Stove pipes of galvanised iron will not bear being blackened with plumbago. Carpenter washes the surface with a weak solution of protochloride of antimony, a single application being sufficient to produce a fine glossy black; *idem*, 1859, v, 1028. A liquid size, a thin coat of which will make any oil colour adhere to zinc; *idem*, 1869, xvi, 170; and in 1874 herr Peischer of Nuremberg has used an acetate of lead with great success; *idem*, 1874, xxvii, 509. Oxide of zinc is a useful vehicle with which to colour iron flue pipes or hot water pipes, inside a building; and zinc may be coloured by an alkaline solution of tartrate of copper immersed at a suitable temperature; 1867.

SULPHATE OF ZINC, improperly called "white vitriol", and "white coppers", is a DRIER for pigments. It is used in the preparation of varnishes; and a green pigment, called Rinmann's green, is formed by mixing 100 parts of zinc vitriol with 2.5 parts of nitrate of cobalt and heating the mixture to redness to produce a compound of the two oxides. **SULPHATE.**

CHLORIDE OF ZINC is produced by heating the metal in dry chlorine gas, when it distils over as a white translucent mass, easily fusible. With water it was used in Burnett's process for preventing DRY ROT. He also made of it a disinfecting fluid (DEODORISER), largely used in place of chloride of lime.

OXIDE OF ZINC is prepared chiefly in two ways:—I, by burning the metal, the zinc vapour being sometimes produced extempore from a mixture of roasted ore and carbon; and II, by heating the basic carbonate. It is an infusible solid, intensely yellow at a red heat, but on cooling becomes white: that obtained from the carbonate, if made yellow at red heat retains a yellow shade. Oxide of zinc is insoluble in water, and does not combine directly with it; it dissolves in aqueous acids and aqueous caustic alkalis. It has been more celebrated as a pigment than used, but wanting the body and brightness of fine white lead in oil; while in water colours, Constant or Barytic white, and Pearl white, are superior to it in colour and equal in durability. Its powers in house painting on account of its durability in oil and water extend to its innocency with regard to health. FIELD, *Grammar of Colouring*, 8vo, 1858, p. 20. 71.

ZINCED or ZINKED IRON (Fr. *zincage de fer*). There are two methods of coating metals with zinc: I, by immersing articles in molten zinc; and II, by precipitating the zinc from a solution by means of galvanism. The solution most commonly used for this latter process is a weak solution of oxide of zinc in potash ley. In 1848-9 M. Riepe made many experiments at the laboratory at Berlin, on the solution best adapted for this purpose; CIVIL ENGINEER, ETC., *Journal*, 1849, xii, 255. In the so-called "galvanizing", the iron sheets or articles are first immersed for several hours in a bath of diluted hydro-

chloric or sulphuric acid, or a mixture of both. Then placed in cold water; taken out, scrubbed and scoured; placed in a bath of pure acid, dried in a hot closet, and while hot dipped in a bath which contains molten zinc, covered with a thick layer of sal ammoniac. From this they are slowly raised to allow the zinc to drain off, and then the sheets are passed through plain rollers for the market. Smaller articles are put into cold water and wiped dry. **GALVANIZED IRON**, properly zinked iron, and tinned iron. This coating is resorted to when it is necessary to immerse iron in sea water; but the zinc must be pure, and great care taken in cleaning the surface; **OXIDATION.** The iron plates of the roof of the new Houses of Parliament were coated with zinc; it did not resist the impure atmosphere of London, and so became partially covered with rust; sir C. Barry in *BUILDER Journal*, 1857, xv, 376; and *BUILDING NEWS Journal*, iii, 695. They were then painted with "Indestructible paint", and the roof of the Clock tower with "Torbay paint"; in 1891 they were in a good condition.

ZINC WHITE. Oxide of zinc. As a pigment it is second only in importance to white lead. It is well known for its intense whiteness, its resistance to sulphurous and other deteriorating causes, and its harmless qualities to the painter and to the inmates of the house under decoration. It is requisite that the oil used with it should be as white and clear as possible, all the brushes and pots well cleansed with spirits if they have been used before for white lead, and driers or colours with a lead basis should not be mixed with it. Zinc white possesses less body than white lead, and great care is requisite that the colour, when ground in oil, is of sufficient consistence to be laid on a flat surface without showing through; for in that state any oil in excess will form a slight glutinous coating on the surface, retaining every particle of dust brought in contact with it, until it has evaporated. In general this white will not dry so quickly as the older material, but this defect can be remedied by the use of proper drying oils. With these precautions a few trials will enable any painter, who chooses to work zinc white, to overcome the difficulties, which appear at first to condemn the invention. It is asserted that it should be used only for inside work as it has been found not to resist the influences of the atmosphere outside; also that, in consequence of the great durability of the colour of this paint, a house painted with it may be washed for a succession of three, four, and even five years; and that after each successive washing, the surface will be found as clear and bright as when fresh painted; PAPWORTH, in ROY. INST. OF BRIT. ARCHITECTS, *Sessional Papers*, 1857; and *BUILDER Journal*, xv, 670. Its preparation is carefully defined in Newton's *London Journal*; and CIVIL ENGINEER, ETC., *Journal*, 1849, xii, 286: the proportions of oil and turpentine, with other details by R. G. Fisher of the Vieille Montagne Zinc Company, after its extensive use on the Continent and in America, are related in *THE BUILDING CHRONICLE Journal*, 1855, p. 248, and *BUILDER Journal*, xiii, 369; also *idem*, p. 109, 193, 243-4, reviewing CHEVREUL, *On Colours*.

Its quality is determined by its whiteness and body. The zinc white imported into America is chiefly made by the Société Anonyme de la Vieille Montagne of Liège. There are three grades of it, 1, the "Paris green seal"; 2, the "Paris red seal"; and 3, the "Antwerp red seal". The quality of French zinc oxide is considered superior to the American grade in purity of colour. A means of giving body to this material was said to have been discovered by G. Lewis of Philadelphia; its acquisition to oxide of zinc is a matter of great importance; *BUILDER Journal*, 1863, xxi, 571. Part of the inventions of C. Titterton in 1857, was to subject white zinc to hydraulic pressure in order to obtain "body"; *idem*, 1857, xv, 18. Zinc white is employed in the manufacture of rubber; of pottery; and of various sorts of paper. 71.

In 1809 it was stated that a mine of zinc ore had been discovered in Craven, Yorkshire; "it has been used in painting instead of white lead; it does not blister, is more adhesive, and

is not decomposed by salt water". It is there found at the bottom of caverns, surrounded by vitrified stones, and is supposed to have been sublimed by heat; "if a full supply can be obtained and found to answer the purpose intended, it is possible that the use of white lead as paint, with its deleterious effects, may be in a great degree superseded"; ACKERMANN, *Repository of Arts*, 8vo., 1809, ii, 112-3. Guyton DE MORVEAU, of Dijon, related his attempts to obtain a good white for paint; and obtained zinc, which, pure and separated from iron, did not lose colour, and strongly recommended it to painters; PARTINGTON, *Builder's Complete Guide*, 8vo., 1825, p. 567-9. Mallet in 1839, stated the composition of zinc paint as

| | | | | | | | |
|-------------------|-----|-----|-------|--------|-----|-----|--------|
| Sulphuret lead | ... | ... | 9.05 | Silica | ... | ... | 1.81 |
| Oxide zinc | ... | ... | 4.15 | Carbon | ... | ... | 1.20 |
| Metallic zinc | ... | ... | 81.71 | Loss | ... | ... | 1.94 |
| Sesqui-oxide iron | ... | ... | 0.14 | | | | 100.00 |

INSTITUTION OF CIVIL ENGINEERS, *Proceedings*, and CIVIL ENGINEER, ETC., *Journal*, 1840, iii, 425. Edme Jean Leclaire, housepainter of Paris, about 1842, with the help of experts discovered how to utilise white of zinc, in place of white lead, *i.e.*, how to procure it sufficiently cheap, and make it dry with sufficient rapidity. He entirely suppressed the use of white lead in his establishment, and thereby, as far as his own workmen were concerned, put a stop for the future to "painter's colic" and all its train of attendant and consequent miseries—work executed with it is both fresher and more durable than that done with the old deleterious ingredients; s. TAYLOR, *Profit Sharing*, 8vo., 1884, p. 5.

The experts of the French discovery (about 1849) deputed Messrs. Hubbuck of London, to manufacture it for sale. During its manufacture a stream of atmospheric air is made to constantly disseminate itself throughout the preparation, and by this simple process the many objectionable characteristics of the zinc paint, in general, are effectually removed. *Hubbuck's patent zinc white paint*, is a pure zinc paint, does not change colour with the London atmosphere; and is warranted to retain its colour in any climate and in outside work. Two cwt. with six gallons of oil cover as much surface as three cwt. of white lead and twelve gallons of oil. Still it is found too often adulterated with 10 to 30 per cent. of sulphate of barytes. *BUILDER Journal*, 1858, xvi, 481. 1. 71.

French zinc paint or permanent white, combines superiority of body with beauty of colour; it resists the effects of sulphuretted hydrogen and carbonic acid, and retains its whiteness for years; 1880.

Jay's metallic paint company, Vauxhall; made of resin and oxide of zinc, benzoline, and turpentine; *BUILDING NEWS Journal*, 1870, xviii, 328.

Oxy-chloride of zinc paint. An invention of — Sorel of Paris since 1855, substituting it for the oxide of zinc; certain difficulties were overcome, and various advantages gained, as described in *BUILDING NEWS Journal*, 1858, iv, 288. Sorel also states (*BUILDER Journal*, 1862, xx, 104) that it is superior to plaster of Paris for coating the walls of a room: thus a coat of oxide of zinc mixed with size and made up like a wash, is to be first laid on the wall or ceiling, and over this a coat of chloride of zinc applied, being prepared in the same way as the first wash. The oxide and chloride effect an immediate combination, and form a kind of cement, smooth and polished as glass, and possessing the advantages of oil paint, without its disadvantages of smell, etc.

Oxy-sulphide of zinc paint, known as Griffith's patent white, covers 100 per cent. more than oxide of zinc; and covers 25 per cent. more than white lead (T. Griffith of Oxtou, Liverpool). His *patent zinc white* or substitute for lead, is prepared from white sulphide of zinc, or zinc sulphate, being first precipitated by sulphide of sodium, and to the mixture was added a certain proportion of chloride of barium. The resulting precipitate of sulphate of barium is intimately mixed with the

first precipitate of sulphide of zinc, and the washed precipitates subjected to a red heat for several hours in a reverberatory furnace. The product was found to be excellent as regards body, and equal to white lead, and the tint was pure. It was eventually found that a small quantity of magnesia gave a softness to the pigment and caused it to unite with the oil; BARFF, *Zinc White as Paint*, read at SOCIETY OF ARTS Journal, 13 February 1877; *BUILDER Journal*, xxxv, 180.

ZINC WORK. Of late years, certain properties possessed by zinc, and its comparative low price, have led to an extensive use of it for a variety of purposes, as a substitute for lead, copper, and tin. Objections made to the employment of this material for *roofing purposes* (in the United States of America in 1857 it was stated to be worthless) caused the Vieille Montagne zinc company of Belgium, to improve the mode of laying zinc for roofs, and to prevent the use of thin gauges of sheet zinc, which are unfit for the purpose. The sheet zinc is rolled from their spelter of a superior quality. For roofs on boards no gauge should be used thinner than No. 14; and for roofs without boards, No. 15 or 16: Nos. 17 and 18 principally for gutters. The lightness of the metal makes it valuable for covering buildings requiring large spans, with comparatively light framing. £3 per square was estimated up to 25 ft. span including framework and fixing, the zinc being not less than No. 13 gauge or 20 oz. Each sheet should be laid free and unconfined by nails or solder; they run 2 ft. 11 ins. from centre to centre of rolls; and are 8 ft. in length.

An outline specification for the trade of the *zinc worker*, is given in GWILT, *Encyclopædia of Architecture*, edit. 1888, p. 778. The cutting or slicing of zinc is done by a cutting bench with circular shears or cutting disks, revolving in opposite directions: or even by a common short saw. Among the other purposes of its use are: *Spelter cakes* weighing about 30 lbs. each, prepared for the zinging of iron articles. Smaller cakes for galvanic batteries, each being from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick. *Rain water pipes, and heads; tubes* for bell wires, speaking tubes, and so on, which with *sash* and *casement bars* are formed by the metal sheet being cut to the required width, and passed through a draw-bench, coming out a tube requiring only to be soldered along the seam to be ready for use. *Ornaments* and enrichments of all sorts, mouldings for Mansard roofs, gables, vanes, finials, and decorative work. *Stamped ornaments* date only from 1852. At Helsingfors cathedral, Finland, are colossal *statues* cast in zinc of the twelve apostles, after those by Thorwaldsen at the church of Our Lady at Copenhagen; these were the largest ever cast at Berlin; six were done in 1847; B. J., 1847, v, 294. *Spire* is very common on the continent, in America and Canada; in England, Ripple church, near Walmer. *Ogee* and other shaped *eaves gutters*. In Belgium, eaves gutters have a fillet of oak an inch square fastened under them by zinc bands about an inch broad and a foot apart soldered on; the top edges stayed by zinc rods across the gutter. *Cowls* and the various articles for smoky chimneys, as lobsters, verticals, maltheuses, Brightons. *Rain-water heads*. *Perforated zinc* of an infinite variety of patterns for ventilation to dairy and other windows, to larders, meat-safes, window-blinds; covering to hot pipes, sifters, beds for troop-ships. *Nails* for slating, varying from 1 in. to 2 ins. in length. *Wires* of various gauges, by a patent obtained by the inventor in one of the towns of the north of England, before 1847; a wire one-tenth of an inch diameter will carry 26 lbs. *Baths* of all shapes and sizes. *Cisterns*, are bad where there is salt in the water; at Lyons, as much as 15 grains of zinc were found in each quart of water; they should be coated with oil paint, of which the bases are ochres, or with asphalte (*BUILDING NEWS Journal*, 1871, xx, 346); *CISTERN*. Elder wine boiled in an iron vessel cased with zinc (*i.e.*, galvanized iron), was found to contain a considerable quantity of acetate of zinc and a less proportion of acetate of iron; the former of these salts is of a very poisonous nature; *Newspapers*, January 1859.

Corrugated zinc for partitions and roofs are much used; NOUVELLES ANNALES DE LA CONSTRUCTION, fol., Paris, 1855, i, pl. 43-6 for railway stations. Plates for engraving upon, called zincography, as opposed to lithography.

An Examination of Existing Facts relating to Zinc Works on the Continent, etc., for C. Devaux and Co., by J. Edmeston, 4to., London, 1861 (?), read at the Inst. of Brit. Architects, 1859-60, p. 182. "The Ironmonger and Metal Trades Advertiser" of 31 Jan., No. 21 of vol. iii. THE ENGINEER Journal, for 31 Oct. 1856, p. 583, with cuts. *Spons' Architect's, etc., Pocket Book*, by W. Young, 1881, 8th edit. AIDE MÉMOIRE, 8vo., 1848-54, ii, 136. ALLGEMEINE BAUZEITUNG, 1853, pl. 602-5, gives the "zinkwalzwerk" at Kattowitz. *Zinc, as Applied for Roofing Purposes, with Examples*, by Messrs. Braby and Co., 8vo. D. MACGIBBON, *Notes on the Use of Zinc*, 4to., Edinb., 1878. GEISS *Zinkguss Ornamente von Schinkel, etc.*, 8vo., 1849 (1864?) ROMBERG, *Zimmerwerks Baukunst*, 4to., Leipzig, 1846-56, pl. 47. MANDAR, *Etudes d'Architecture*, fol., Paris, 1826, pl. 13. DALY, *Revue Générale*, 1840, i, 99, etc.; ii, iii, v, xi, xiii, xvi; 1865, xxiii; xxiv, xxv, xxx. BUILDING NEWS Journal, *Use of Zinc*, 1859, v, 790, 825, 846, 868, 890, 913. 1.

ZINGARO; Lo. See SOLARIO (ANTONIO.) 36.

ZINIRI. See JALI.

ZINKED IRON. The proper name for what is usually called GALVANIZED IRON. ZINCED IRON.

ZIZYPHUS. The *Quercus suber*, Cork tree, a native of the warm parts of Spain, especially Catalonia, Valencia, and Alentejo. Corkwood, commonly cork, is formed by the tree between the outermost and innermost layers of the bark, and is usually removed every six or seven years. It is considered to have been first used for stopping bottles about 1670-1715. Among other purposes for which this substance is used, is that of the chips and cuttings being ground up and mixed with india rubber to form kamptulicon floor-cloth; and ground up cork with boiled linseed oil backed by canvas as linoleum. ENCYC. BRITT., 9th edit., 1877. Also for life-belts, mattresses of ships, and other buoys filled with cork. Male cork, as first formed about the tree is very rough; it is used for facings for damp walls (liège mâle), applied outwards and plastered, so that it can be papered over; BUILDER Journal, 1880, xxxix, 158. Zizyphus lotus is the LOTUS of the ancients. A species of Zizyphus in Travancore, East Indies, is very light and soft and a good substitute for the true cork for some purposes; also the Polai tree of Singapore; and the Bahnah-thoa of Tavoy. *Cork Trade of Spain*, in SOCIETY OF ARTS Journal, 1892, January, p. 145. 14. 71.

ZMLUS. The labyrinth in Lemnos; see SMILUS.

ZOA. The figures in whole relief against the zophorus or frieze; INWOOD, *Erechtheion*, fol., 1827, p. 94.

ZOAN. The capital of the Hyksos kings, in Egypt. The necropolis, together with large remains of its great temple and other works of Rameses II and Manepthah I, were discovered by W. M. F. Petrie about 1884.

ZOCCOLI (CARLO) or Zoccoli, of Naples, born 1718 (1712 NAGLER), also an engineer, designed many churches and ecclesiastical edifices in the kingdom of Naples, including the Capuchin church and monastery at Arienzo: between 1740-70, the cathedral of S. Casto, seminario, and episcopal palace at Calvi; the convent of the Alcantarini at Pignaturo; the church and baronial palace at Cutignano near Nola; the church and monastery of the Religiogi in S. Giorgio in the territory of Benevento; the villa of the prince of Supino at Portici; and the villa of the marquess Palomba at Cesa, near Aversa. He constructed two windmills on the Volturmo, near Capua, where for the first time the practice of the Dutch dikes on canals was adopted; with nine other mills at Scilla in Calabria; where he also designed a spacious church, and restored the castle, which was completed by his son don RAFFAELLO. He published *Della Servitu*; and two other works; and was appointed Examinatore de' Tavorali, of the Council of Naples. He died in 1771 (1782 NAGLER). 3. 12. 28. 68.

ARCH. PUB. SOC.

ZOCCOLO, ZOCLÉ, or ZOCCO; (It.). A plinth. Also, a square body less in height than breadth, placed under the mouldings of the bases of pedestals, etc.; not under the bases, as is stated in the translation of PERRAULT. It is called in English SOCLÉ. "A continued zoclé" is a continued pedestal on which a structure is raised, but has no base or cornice; a plinth. 4.

ZOCHER (JOHANN DAVID), of Haarlem, landscape gardener; laid out the gardens at Zoestdyk for king Louis Napoleon of Holland, and completed the palace at Utrecht; also designed several houses at Haarlem and Utrecht, and in the environs of the Hague. He died 1818 at Zoestdyk, aged nearly 60. 24.

ZOCHER (JAN DAVID), born 12 February 1791 (not 1790), at Haarlem, was son of Johann and his pupil; 1809 travelled on a pension from king Louis Napoleon; studied under Lebas at Paris; and 1811-14 in France, Italy, Switzerland, and England. He designed the tomb at Broekhuysen; completed the garden buildings at Zoestdyk; settled at Haarlem; designed the enlargement of Utrecht nearly by one-third; a new quay; the residence near the Hague bought by the king for the prince Alexander; improved the country residence of prince Frederick; designed several country houses near Haarlem, Utrecht, Loenen, and other towns; the monumental lighthouse in memory of Van Speyk at Egmond; the new bridge and quay at Delft; 1840 competed for the exchange at Amsterdam, his design being selected and carried out 1840-4 but not (?) under his supervision; and laid out many grounds in Holland, Belgium, and Prussia. He was a Hon. and Corr. member of the Roy. Inst. of Brit. Architects. He died 1870. His son Louis Paul was architect and painter. GOETGHEBUER, *Choix des Mons. de Pays Bas*, fol., Ghent, 1827, p. 38, 43. 24. 68.

ZOCHER (KAREL GEORGE), born 14 November 1796, at Haarlem, another son of Johann David, settled at Utrecht, where he became well known as a landscape gardener also. In 1840 he designed the Roman Catholic church in that city; and after 1838 the church at Hoorn, which had been burnt. He transformed the ramparts of Middelburg, Tiel, and Hoorn into good promenades. 24. 68.

ZODIAC. An imaginary zone of the heavens within which lie the paths of the sun, moon, and principal planets. It is bounded by two circles equidistant from the ecliptic, about 18° apart; and it is divided into twelve equal parts or signs, marked by twelve constellations. The twelvefold division of the zodiac was evidently suggested by the occurrence of twelve full moons in successive parts of it in the course of each year. The signs receive their denominations from those of the figures intended to designate the constellations or groups of stars about them.

| | | | |
|-----------|-----------|----------------|----------------|
| ♈ Aries. | ♍ Virgo. | ♎ Libra. | ♏ Pisces. |
| ♉ Taurus. | ♌ Leo. | ♍ Scorpio. | ♐ Aquarius. |
| ♊ Gemini. | ♋ Cancer. | ♌ Sagittarius. | ♑ Capricornus. |

These hieroglyphs of the signs are found in MSS. of about x cent., but in carvings not until xv or xvi cent.; their origin is unknown, but some, if not all, of them have antique associations. Leo for instance occurs in the symbols of the Mithraic worship. The most ancient zodiacal representation in existence is a fragment of a Chaldaean planisphere in the British museum.

Assyrian cylinders and inscriptions indicate for the familiar series of text-books an antiquity of some four thousand years; ages before Asurbanipal reigned at Nineveh the signs were known, of which Aries was always the first. The Chinese mode of dividing the "yellow road" of the sun was, however, by the twelve cyclical animals—Rat, ox, tiger, hare, dragon or crocodile, serpent, horse, sheep, monkey, hen, dog, and pig. The opening sign, the rat, corresponds to aquarius. It is curious to find the same sequence of symbols employed for the same decorative purposes in India as in Europe. A perfect set was copied 1764 from a pagoda at Verdapetah near cape Comorin; another on the ceiling of a temple near Mindurah.

The Acaadian Calendar, by PLUNKET, in *Proceedings of the Society of Biblical Archaeology*, 8vo., 1892, xiv, 112-9. BAILLY, *Histoire de l'Astronomie Ancienne*. EPPING UND STRASSMAIER, *Astronomische aus Babylon*.

Egyptian. A small circular planisphere in a temple at Dendera, or Tentyris, was discovered 1798 by general Desaix; and carefully removed 1821-2 by mons. Lelorrain to the Bibliothèque nationale, at Paris. It was supposed to date 3600 B.C., or 2261 (COLE), or 716 B.C., but the date of inception is now put at 46 B.C. The rectangular zodiac still *in situ* in the portico of the temple of Isis at Dendera suits, as to constellational arrangements, the date 29 A.D.; it probably sets forth the natal scheme of the building it served to decorate. DENON, *Voyage dans l'Égypte*, 2 vols., fol., Paris, 1802, pl. 14; translation, 3 vols., 8vo., Lond., 1803. *Description de l'Égypte*, fol., 1809-28, iii, pl. 4. PENNY CYCLOPÆDIA, 8vo., 1843, xxvii, p. 794. HAMILTON, *Égyptiaca*, 4to. and fol., 1809, pt. i, 206-14, relates the views of VISCONTI, and of DE LA LANDE. COLE, *Circular Zodiac of Tentyra*, 1824. ST. MARTIN, *Le Zodiaque de Denderah*, 1822. JUDAS, *Le Zodiaque de Dendera*, 1859. LETRONNE, *Objets des représentations Zodiacales qui nous restent de l'antiquité*, 1824. CARTERON, *Analyse des recherches de Letronne*, 1843. ROBERTS, *Origin of Constellations*, 8vo., Dublin, 1802. *Le Zodiaque égyptique*, 1809. TESTA, *Sopra due Zodiaci scoperti nell' Egitto*, 1802. LEFRINCE, *Interpretation du Zodiaque circulaire*, 1822; others by LATREILLE, D'AYZAC, PARAVEY, DALMAS, 8vo., 1817-23. HALMA, *Explication des Zodiacs Égyptiens*, 2 vols., 8vo., Paris, 1822. MARIETTE, *Denderah*, 4to., Paris, 1875; 5 vols., fol., plates, 1870-74. A French model was presented by A. J. Beresford Hope to the Fitzwilliam museum at Cambridge.

The two temples at Esneh, or Latopolis, have in the ceilings of the porticoes (cir. 41-138 A.D.) representations of the twelve zodiacal constellations; position about 700 B.C.; "all these are supposed to date back a little more than 1,800 years"; NOTES AND QUERIES *Journal*, 1871, 4th Ser., vi, 529; and vii, 65.

With exact position of the planets, on a coffin, in the British museum, 1722 years before Christ; BULLER *Journal*, 1860, xviii, 16. *Hermopolis magna*, Achmin, Echmin or Oshmoonayn; on one of the entrances are four concentric circles in a square containing the twelve signs, etc.

Mexico. In the ruins of Palenque has been found a piece of sculpture, supposed to be a planisphere, on which are eighteen compartments representing months, which are disposed three together in the interior of a ring ornamented with hieroglyphical figures. In 1790 in the city of Mexico was discovered, among the foundations of the temple of Mexitli, a block of porphyry, 5 or 6 ft. wide, on which are described symbolical figures, in which the several days of the year are distinguished by names and objects—some are nearly the signs on the Chinese planispheres. HUMBOLDT, *Researches*, etc., 8vo., London, 1814, remarks that the name of the first day is also the name of water, and that the symbol of the day consists of undulating lines resembling those which indicate Aquarius in the Greek and Egyptian zodiacs. NEBEL, *Voyage Pitt. du Mexique*, fol., Paris, 1836, last plate but one.

Hebrew. BROOME, *Astral Origin of the Emblem, the Zodiacal Signs, and the Astral Hebrew Alphabet*, 4to., 1881. The Hebrew zodiac described in NOTES AND QUERIES *Journal*, 1891, Nov. 7th, 7 Ser., xii, 383.

A Chinese zodiac, on a mirror, is engraved in PETTIGREW, on *Ancient Chinese Vases*, from THOMS, *Dissertation*, etc., on *Vases from 1743 to 1496 B.C.*, 8vo., London, 1851; (*Journal of the Brit. Archæol. Association*, 8vo., 1852, viii, 32).

Palmyra; Temple of the Sun.

HAGER, *Illustrazione d'un Zodiaco Orientale del Gabinetto delle Medaglie di S. Moestà a Parigi, scoperto recentemente presso le sponde del Tigris in vicinanza dell' antica Babilonia*, etc., fol., Milan, 1811.

One dug up in 1705 on the Aventine and now in the Louvre, dates from 2nd or 3rd century A.D.

Milan. On façade of cathedral, XII or XIII cent. PUCINELLI, *Zod. di Milano*, ii.

Lucca. Pisa; baptistery. Parma; baptistery, fragments. Venice; ducal palace; the Zodiac capital; RUSKIN, *Stones of Venice*, 8vo., 1851-53, ii, 352-362; ii, 271; and on one of the archivolts of the great central entrance to S. Marco.

Piacenza; in tessellated pavement of the crypt, cir. x cent. of S. Savino (church rebuilt xv cent.); *Handbook to North Italy*, 1846, p. 373; FOWLER, *Medieval representations of the Months and Seasons*, in *ARCHEOLOGIA*, 1873, xlv, 172.

Florence, San Miniato, mosaic pavement; the baptistery pavement, marble and enamel inlay; WARING, *Arts*, etc., fol., 1858, pl. 24.

Siena; WARING, *idem*.

Padua; Giotto's zodiac was remarkable (in its undisturbed condition) for the arrangement of the signs so as to be struck in turns during the corresponding months, by the sun's rays; FOWLER, xlv, 175.

Cremona; over door of cathedral, used by count von Hammer Purgstall in one of his treatises upon Mithraic mysteries; *Handbook to North Italy*, 1846, p. 217.

On monte Pirichiano or Pirchiriano in Piedmont, in the Sacra di S. Michele della Chiusa, re-endowed 966-88, is a vestige of the original edifice, being a semicircular arch with the signs and inscriptions in very early Longobardic characters. CORDERO, *Italiana Architettura*, 8vo., Brescia, 1829, p. 173-4.

Borgo San Donino; a capital of one of the side portals, has bulls' heads for "sol in tauro" of the zodiac.

The French churches of the XI cent. possess zodiacs, while the large cathedrals of the XII and XIII cents. exhibit on their portals a species of rural calendar—as at Notre Dame at Paris. The signs also appear in the choirs.

Bourges; tympanum of the doorway of the church of S. Ursin; JOUFFROY, *Siccles de la Monarchie Française*, fol., Paris, 1823, pl. 38.

Civray; on façade. Sens; Rheims; Lyon; Senlis, cathedrals.

Amiens, church of S. Marcellin; portail, XIII cent.; occupations. At the cathedral, in portail de S. Firmin, are the signs and occupations.

Vézelay, abbey church; chief doorway, with sculptured figures of Christ and the Apostles, early XII cent.; the twenty-nine medallions of the second row of vousoirs represent the signs of the zodiac and the occupations or labours of the year; *Archives des Mons. Histor.*; and VIOLETT-LE-DUC, *Dict. Rais.*, vii, p. 390, fig. 51.

Paris; Notre Dame; porte de la Vierge, in west façade; opening with Aquarius, cir. 1220; LENOIR, *Musée Impérial des Monuments Franç.*, fol., Paris, 1810-11; FAURIS DE S. VINCENT, in *Magasin Encyc.* for Sept. and Oct. 1815. GUILHERMY, *Itin. Arch. de Paris*, 1855, p. 64. GUILHERMY ET VIOLETT-LE-DUC, *Descr. de N. D.*, 1856.

DURANDES, *Rationale* (1290; died 1296), describes a church, carvings on the walls and of images, the zodiacal signs and scripture subjects; BULLER *Journal*, 1860, xviii, 795b.

Paris; S. Geneviève; deposited in the court of the Ecole des beaux arts. LENOIR, *Des Arts en France*, 4to., Paris, 1811, pl. 23. LENOIR, *Musée des Monuments Français*, 8vo., Paris, 1800-6, vii, No. 514. LENOIR, *Statistique de Paris*, fol., Paris, 1843.

Chartres; in centre door of west front of the cathedral, showing also the agricultural labours. LASSUS, *Monographie*.

S. Omer; S. Bertin, in portion of mosaic pavement; WEALE, *Belgium*. Germigny; the portail is a fine work of XI to XII cent.; in the archivolt is a string of angels and a fine zodiac; ALLIER ET BATISSIER, *Ancien Bourbonnais*, fol., Moulins, 1832-8; and TOUCHARD-LAFOSSE, *La Loire historique*, etc., 8vo., Paris, 1856, ii, pt. 2, p. 585.

S. Denis; on pedestal of door to the right of the chief portail, HUGO, *France historique et mont.*, fol., Paris, 1836, iv, pl. 2, 4, 9. LENOIR, *Des Arts*, pl. 20.

"Also in pavement in a chapel of S. Firmin; occupations; LENOIR, *Atlas*, pl. 21.

Church at Issoire, in Auvergne; exterior of choir.

"Avallon, in Auxerre; Romanesque portail.

Autun; cathedral, 1160, on the vousoirs of the grand portail in south front; alternately signs and occupations.

Pritz, near Laval; XIII cent., painted on chancel arch; DE CAUMONT, *Abécédaire*, 8vo., Paris, 1854, p. 375-6.

The "zodiac of labours" was replaced in French castles and hôtels by a "zodiac of pleasures" in which hunting, hawking, fishing, and dancing were substituted for hoeing, planting, reaping, and ploughing; VIOLETT-LE-DUC, *Dict. Rais.*, ix, 551. GUENEAULT, *Dict. Iconographique des Mons.*, 8vo., Paris, 1845.

The great rose windows of the Early Gothic period were frequently painted with zodiacal emblems: as at Notre Dame at Paris.

The zodiac is less common in England.

Ifley, Oxfordshire, offers good specimens.

Merton college, Oxford. Libra is represented by a judge in his robes. Pieces by the dolphin of Fitzjames, warden of the college 1482-1507.

York; S. Margaret Walmgate. Norman porch brought from the hospital of S. Nicholas without Walmgate Bar, at the dissolution, according to Drake. Consists of four recessed arches, the outer one showing the signs of the Zodiac, with an additional one agreeing with the thirteen months of the Anglo-Saxon calendar. Between the signs are figures emblematic of the months. The inner arches and the shafts are all carved with figures. ARCHÆOLOGIA, 1883, xlvii, 355-60.

Denstable church, Bedfordshire; west doorway of four orders, the outer showing zigzag, the next angels and foliage, also the next, and the fourth, some signs of the zodiac. BRITTON, *Arch. Antiq.*, 4to., 1807, i. Malmesbury abbey church, Wiltshire; great west doorway.

A pavement tile from Ulverscroft priory, Leicestershire, xiv cent. is given in THE ARCHÆOLOGICAL JOURNAL, 1846, ii, 89; which also refers to the pavement, a kind of coarse mosaic work, in Canterbury cathedral (ARCHÆOLOGIA, x, 155); and to a set of tiles representing months and signs, in the chancel of Breton church, Warwickshire.

Lincoln cathedral; end of xiii cent., east walk of cloister; in bosses of slight wood groining; BUILDER JOURNAL, 1890; and ASSOCIATED SOCIETIES, *Reports and Papers* for 1889, p. 180; which refers to the three representations in the glass of the east windows of the choir aisles, of xiv or early xv cent. date; to the Norman font at Burnham Deepdale, Norfolk (ARCHÆOLOGIA, x, 177); on font at Brookland, Kent (*ibid.*, vi, 159); to the capitals of the twelve pillars of the choir of Carlisle cathedral (FOWLER, in CUMBERLAND, ETC., ANTIQUARIAN SOCIETY, *Transactions*, 1875-6, ii, 281-96); and to the example at York.

Cologne cathedral, frescoes contain the signs, each with an attendant angel, just as they were depicted on the vault of the church at Mount Athos. 1. 2. 14. 25.

DIDRON, *Annales Archéologiques*, 4to., Paris, 1881, s. v. Signes, and Zodiac; Dendérah, xxi, 238; Paris, xxi, 213; and other references. DUPUIS, *Zodiaque chron. et mythol.*, 4to., Paris, 1806. AUBER, *Hist. etc. du Symbolisme Religieux*, 8vo., Paris, 1871, Les Zodiaques, iii, 449-64. ENCYCLOPEDIA BRITANNICA, 1888, s. v. Zodiac. THE ARCHÆOLOGICAL JOURNAL, for 1892.

ZOGARI (PIETRO). See ZAGURI (P.).

ZOMBIGO (BARTOLOMÉ), or Sombigo de Salcedo, was 18 June 1671 maestro mayor of the santa iglesia at Toledo; completed the vault and its sarcophagi, with other works described s. v. Escorial, where he was assisted by his pupil A. Moreno. He died 14 Aug. 1682. 66.

ZOOLOGICAL GARDENS, London, Regent's park; society founded 1826; incorporated 1829; garden opened 1828; contains the largest and most complete collection of animals in the world. *New York*, in the Central park; plan in *ENGINEERING JOURNAL*, fol., Nov. 1868, p. 429. *Paris*, Jardins des Plantes. *Berlin*; BERINGUIER, *Geschichte des Z. Gartens*, 8vo., 1877; and STRUCKER, *Geschichte der Z.*, 8vo., 1879. The gardens in London, Berlin, Hamburg, Dresden, Amsterdam, Antwerp, and Liverpool, are the subject of a report by W. Sugden and son, architects, printed in THE BRITISH ARCHITECT, October 19, 1883, p. 188-9. MONKEY HOUSE.

ZOOPHORIC COLUMN. A column carrying an animal, as on the piazzetta, at Venice; it is a memorial column. 4.

ZOOPHOROS and ZOPHORUS. The Greek term for the FRIEZE in an order separating the architrave from the cornice. The ornaments thereon, made in early times of terra cotta, were called ANTEPIXA. 1. 4.

ZOPISSA. In 1736 it was described as "The Greek name for the best sort of pitch, scraped from the sides of ships, and tempered with wax and salt". 4.

In 1857 N. C. Szerelmeij took out a patent for "rendering structures waterproof"; an advertisement appeared of this "Granitic composition" in BUILDER JOURNAL, Nov. 5, 1859 (also 1860, xvii, 288). He published *Encaustic and Zopissa Processes, etc.*, 8vo. (1861). These were commented upon by TITE, as stated s. v. SZERELMEY; and an explanation by him in BUILDER JOURNAL, xix, 98. Some of the paints are still advertised.

ZORÈS SYSTÈMES. See HOLLOW GIRDER.

ZORZI (TIBERIO) as maestro, was 1501 with G. Spavento in covering the façade of S. Marco with marble. In 1587 he

voted for a single arch for the Rialto bridge; MAGRINI, *Ponte di Rialto*, 8vo., Vicenza, 1854, p. 26.

ZOTHECA (Gr. ζῳθηκα). An ALCOVE, or a small room, which might be added to, or be separated from, the room which it adjoined. NICHE. "A place for keeping live animals"; SHIPLEY, *Glossary*, 8vo., 1872. 1.

ZUCCALI (HEINRICH) or ZUGALLI, an Italian, was *hofarchitekt* to the elector Max Emanuel of Bavaria, who 1684 sent for him to design the new palace of Schleissheim, the former hunting château with farm buildings (erected by H. Schön for Maximilian I) having been rendered uninhabitable during the thirty years war. This extensive palace was continued till 1694 by Zuccali who then appears to have died or returned to Italy, and was completed 1704 under *oberbaumeister* J. Effner. The unfinished grand staircase was also by Zuccali, and not by Lespiller, to whom it has been attributed. Zuccali also prepared a design for the palace at Lustheim; and at Salzburg 1685 the Theatiner church; the monastery, now the military spital; and 1686 S. Erhard's church. LIPOWSKY states he was living in Munich in 1732 but this is an error. 68.

ZUCCHERO and ZUCCARO (FEDERIGO), son of Ottaviano Zuccaro, of S. Angelo in Vado (and brother of Taddeo, born 1529), born there 1543, became a pupil of Taddeo and an eminent portrait painter, and finished the works of his brother after his death 2 Sept. 1566 at Rome, who was buried by the side of Raphael. Federigo was in England in 1574 and painted many portraits; returned to Rome; designed a house there for himself with four portals, on the Monte di Trinità, and painted the outside in fresco work. Then visited Spain, which country he left in 1588 richly rewarded; 1595 founded the accademia di S. Luca at Rome; published *L'Idea di Pittori, Scultori, e Architetti*, fol., Turin, 1603, and 1607; and died in 1609 at Ancona, aged 66. The "facciata rustica del casino dello Zuccheri", at Florence, given in RUGGERI, *Scelta di Arch.—di Firenze*, fol., Flor., 1755, ii, pl. 78-9, is the only other work in architecture named. WALPOLE, *Anecdotes*, 8vo., edit. 1862, i, 161. 14. 30. 38. 73.

ZUCCONI (FRANCESCO), of Venice, where he practised in xvii century, and designed the fine campanile of Sta. Maria Formosa.

ZUERICH. (Anc. Turicum or Tigurium; castrum Turegum of Charlemagne). The capital of the canton of the same name in Switzerland, situated on the river Limmat, at the north-east extremity of lake Zürich; over this river are six bridges, of which the muenster bridge 1837-8, is of granite and black marble; also the station bridge 1861-3; while over the river Sihl are five others including the railway bridge. The ramparts have been levelled to form promenades. The railway station, finished 1871, has a façade 335 ft. long, with a station itself 530 ft. long and 140 ft. wide in one span. There is a monument to the poet S. Gessner (1730-58); one to Nägeli designed by F. Stadler; and one to Zwingli. The Gross münster, dedicated to S. Felix et Regula, is a heavy Romanesque structure of xi to xiii cent., plain and covered by whitewash; a good crypt; triforium galleries for women; two large west towers xv cent., had 1504 and in 1654 octagonal spires above the gables, burnt 1799 and rebuilt as now; the curious cloisters are best Lombard work (restored), the "small pillars and round-headed arches, enclosed at each third in the row within larger ones supported by large columns" (HOPE, *Historical Essay*, 8vo., 1840, p. 292; and plates; shown in STREET, *Brick and Marble Arch.*, 8vo., 1855, p. 20-1); VÖGELIN UND KELLER, *Der Gross Muenster, und das Kloster Kappel*, 4to., Zurich, n. d.). The Frauenmuenster xiii-xiv cent. was once a nunnery, now completely restored. The Dominican or Predigerkirche, xiii cent., has the large cantonal library arranged in the gallery. Augustinerkirche, xiv cent., used by the old catholics has been 1844 well restored; the high altar by Stadler is given in ALLGEMEINE BAUZEITUNG, 1846, pl. 17. Peterskirche, rebuilt 1705, except the good tower xiii cent., 200 ft. high, which contains a large clock. Neumuensterkirche (Greek) 1836-40 with two towers. Gross-

muenster kapelle Sta. Anna, after 1844 the English church; and a French reformed church 1858 Gothic.

The *rathhaus* 1694-8, designed and built by J. J. Scherer, a large massive edifice with stone busts above its windows. The *kunsthause*, late xv cent. is a "curious" building. The new university 1832-3 occupies the buildings of a former Augustine monastery, wherein G. Semper was professor, who 1860-64 with Wolf designed the polytechnic schools for 1,000 pupils, at a cost of two and a half millions of francs. The exchange 1877-9, Italian. Town library, founded 1620, in the former Wasserkirche, built 1479 by Hans Felder or Yelder, of Ottingen, consists of about 20,000 volumes, and 4,000 MSS.; museum of Roman antiquities and medals, designed *cir.* 1770 by N. Spruengli of Berne. The Kantons spital and medical museum, opened 1842, is 360 ft. long, with twenty small wards, 437 beds, (described by HUSOX, *Etude sur les Hôpitaux*, etc., 4to, Paris, 1862, p. 442-8, pl. 12, from the guide by dr. SCHRAMLI, *Descr. de Nouvel Hôpital*, n. d.; and in DALY, *Revue Générale*, 1864, xxii, 232). Kanton schule 1842, by Schinkel. Kinderspital 1872-3. Blind and deaf asylum 1836-7. Lunatic asylum 1864-70. Chemical laboratory, etc., 1875. Theatre, for from 1,250 to 1,300 spectators, 1833, designed by Viennese architects, and completed under Austrian artists, for the Zurich society (BRITISH ARCHITECT *Journal*, Sept. 25, 1891, p. 225). Casino or assembly rooms. The *tonhalle* 1867 for 2,000 seats. The offices of the Schweizeresche Kredit Anstalt, 1873-7, cost £100,000. The exchange, of which the hall is 106 ft. long by 71 ft. wide, and 55 ft. high. A large penitentiary. New police and guard house. Barracks 1876 for 1,400 soldiers, and large riding school opposite and detached. Post office 1872; corn market 1858-9; new arsenal; observatory; aquarium; abattoir 1853-65; zoological gardens; botanic gardens from 1837; and district court building, 1857-8. The Wellenburg tower and dungeon is on an island. LACUSTRINE DWELLINGS. SWITZERLAND. ROEMER, *Strassburg und Zür.* in den Jahren 1576-1870, 8vo., Zur., 1884. *Gesellschaft für Erforschung, etc., Mittheilungen, "Der Grossmünster"*, by VOGELIN, Band i, 4to, Zur., 1841, etc. HARPIN, *Zür. and its Environs*, a guide, 8vo. (1880). T. M. RICHARDSON, *Sketches in Italy*, etc., fol., 1837. WYSS, *Geschichte der Abtei Zürich*, 853-1524, 12 pl. of arch., 4to, Zürich, 1851-8. VOGELIN, *Das alte Zürich*, 1874; 2 vols., 1878-90, new edit. FÜSSELI, *Zürich und die wichtigsten Städte am Rhein*. 14. 15. 28. 50.

ZUG. The capital of the smallest canton in Switzerland, and situated on the lake of the same name. It has been called "the little Nuremberg". The town walls have been removed, but all the watch towers except one remain. The principal church, called cathedral, dedicated to S. Oswald, king of Northumbria, 1483-1545, is good German Gothic, (CHAPUY, *Moyen Age Pittoresque*, fol., Paris, 1837, pl. 40); fine choir stalls 1484; a painted pulpit; stone tabernacle from S. Wolfgang; and a lofty tower; curious statues on the buttresses. Near it is a Capuchin monastery dating 1595-7. The church of S. Michael outside the town has a bone-house of the end of xv cent.; the quaint cemetery is remarkable. The Capuchin nunnery and school near, since 1611, but a religious house from *cir.* 1300. The town hall, handsome gymnasium, and arsenal, deserve notice. 14. 28. 50.

ZUGA (Gr.). The lintels of the doorway (*theroma*); quoted in INWOOD, *Erection*, fol. 1827, p. 94.

ZUGALI or Zugalli (CASPAR), of Munich, designed the circular Cajetanerkirche at Salzburg. 26.

ZUGALI (HEINRICH), 1685-6 at Salzburg. See ZUCCALI (H.).

ZUMAETA (NICOLAS DE), 1674 succeeded D. de Idiaga in the church and monastery for the Franciscans, at Tolosa. 66.

ZUMAETA (don FRANCISCO JAVIER DE), brother-in-law and pupil of don M. CARRERA, in 1741 rebuilt with him the *crucero* of the parish church of Cegama in Spain. 66.

ZUMARRAGA (MIGUEL DE), *aparejador* to A. de Maeda, 1587-1618 in the works of the *sala capitular* at Seville

cathedral; and the chapel of the *sagrario*, completed by F. de Oviedo. He died 3rd July 1651. 66.

ZUMARRESTA (CRISTOBAL DE), constructed the portal designed 1625 by J. Gomez de Mora, for the celebrated church at Renteria, in Guipuzcoa. 66.

ZUNI. Along the banks of the Little Colorado river, in Arizona, and just over the border in New Mexico, are extensive ruins. BUILDING NEWS *Journal*, 1874, xxvii, 153, 271; 1880, xxxviii, 727. 50.

ZUNZUNIGUI (JUAN DE), with el maestro Mignel de Abarca was 1674 called upon to make the formal inspection, upon completion, of the works of the church and convent of the Franciscans outside Tolosa. 66.

ZUPORTE TREE. The same as the Sapote timber, used, sometimes carved, at CHICHEN-ITZA only for beams and lintels. The wood is well known for its remarkable durability and solidity; NORMAN, *Rambles in Yucatan*, 8vo., New York, 1843, p. 114.

ZÜRICH. See ZUERICH, in Switzerland.

ZUSTRIS (FRIEDRICH). See SUSTRIS (F.).

ZVENIGOROD. A town in Russia, on the river Znigly, south of Kiev. The old cathedral is given in "Zodteschy" *Journal* for 1875, iv, pl. 60.

ZWICKAU. A town in Saxony, situated on the river Mulde; it has an old castle converted into a workhouse; five churches, one dedicated to S. Mary, choir 1453-70, nave 1506-36, and restored 1839, is without towers (Pointed), and is imitated with that at Freiberg 1484-1500 in Saxony, from S. Nicholas at Zerbst; it has interesting monuments; PUTTRICH, *Denkmale*, 5 vols., fol., 1835-52. BERNEWITZ, *S. Marienkirche*. A gymnasium with a library of over 30,000 volumes. 50.

ZWINGER (HERR), appears to be an error for ZWIRNER (...).

ZWIRNER (ERNEST FRIEDRICH), born 28 February 1802 (1801, NAGLER) at Jacobsvald, in Silesia; studied at Breslau and Berlin; 1828 was taken by Schinkel into his office; and at his recommendation in 1833 he was appointed to succeed ... Ahlert as architect at the cathedral at Cologne; he went on with the *restoration* until 1841; then the works for the *completion* of the edifice were resumed, and the first stone laid 4th September of the transepts, of which the ancient drawings were not found; the iron roof of the nave and the central spire were finished Nov. 1860 or 1862; the fine south portal finished 1859; the north portal; organ case 1842 carved by C. Stephan; and 1856 altar piece of the Virgin. He employed F. Statz for some time in the practical duties. Completion of the cathedral 1856, in DALY, *Revue Générale*, xiv, 93, etc. DRAWING. Zwirner restored the *rathhaus* at Kolberg after the design by Schinkel; designed before 1840 the church of S. Apollinaris at Remagen on the Rhine, arranged for the frescoes by Schnorr, for count Fürstenberg of Stammheim (BUILDER *Journal*, 1851, ix, 771); the château for the same count at Herdringen; and the synagogue at Cologne, consecrated Sept. 1861, one of the finest buildings in the Moorish style now extant in Europe; a cupola 32 ft. diameter (B. J., 1861, xix, 655); 1844-6 the protestant church (basilican) in the same city; and many private houses. About 1859 with and under F. Durler of Antwerp he restored the cathedral of S. John at Hertzogenbosch; designed the choir of the chapel of the château de Schwérin; a casino at Duren; and other works. He 1846 contributed to the *Journal des Constructeurs* at Berlin; also a letter to DALY, *Revue Générale*, 1841, ii, 25, "de l'emploi du fer"; wrote *Vergangenheit und Zukunft des Kölner Dombau*, Col., 1844, a valuable account; was one of the judges at the competition for S. Nicholas church (begun 1845) at Hamburg; 1847 elected hon. and corr. member of the Roy. Inst. of Brit. Architects; was also *baurath*; and had several orders. He died 22 Sept. 1861, aged 58, at Cologne. WEALE, *Guide to Belgium*, etc., 8vo., 1859, p. 427-32, 465. STRONG, in pres. Tite's *Address*, 1861-62, p. 13. W. P. 113.

WYATT PAPWORTH.









